plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

MAY · 1960

PLATING MAGAZINE

AMERICAN ELECTROPLATERS' SOCIETY

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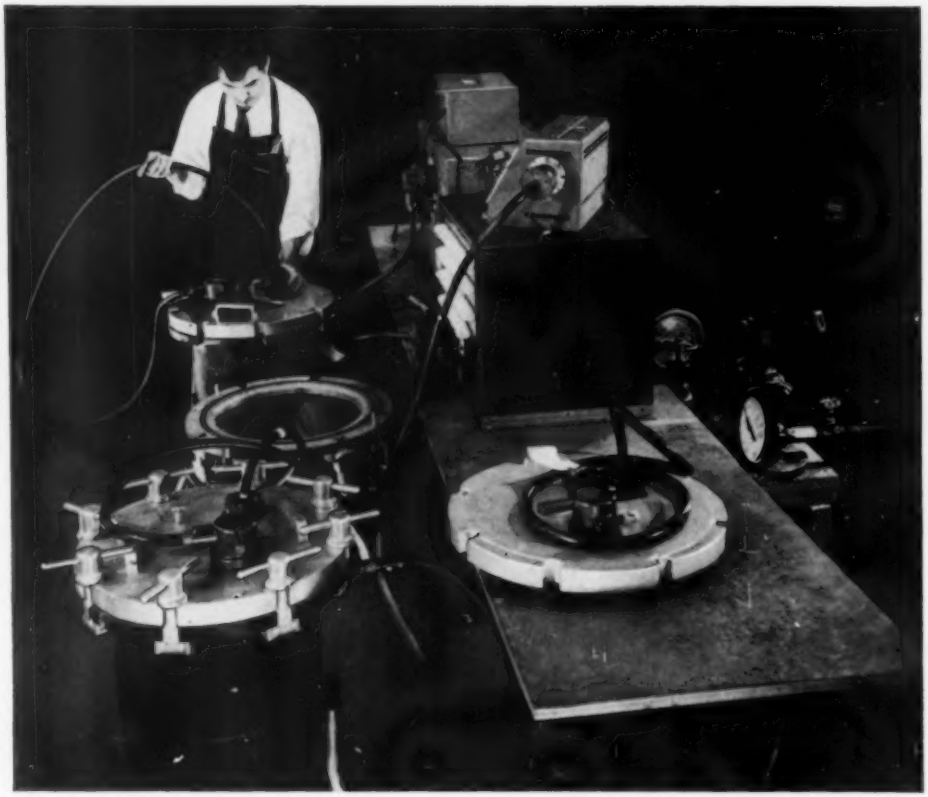
University Microfilms
313 N. First St.
Ann Arbor, Michigan



Torpedo control cables — each with 65 reliable, gold plated contacts and sockets — being tested in water at 750 PSI. The "pinball machine" type testing device has a signal light corresponding to each contact. Faults or failures are easily pin-pointed when any light goes off during testing. This is only one of the exacting endurance tests to which Anton subjects all of its products. 100% testing assures quality and reliability for which Anton Electronics' products are famous throughout industry.

PLATING COSTS DOWN 30%—REJECTS ELIMINATED USING AUTRONEX* ACID GOLD PLATING PROCESS

.....Anton Electronic Laboratories, Inc.

"Since installing the AUTRONEX ACID GOLD ELECTROPLATING PROCESS, our plating production costs are down 30% and still falling", reports Mr. George Weinman, General Manager, Components Division, Anton Electronic Laboratories, Inc., Brooklyn, New York. Mr. Weinman goes on to say that "...during six months' operation—covering the plating of millions of components—plating rejects were practically nonexistent."

As manufacturers of precision potentiometers, connectors, speciel instruments for Atomic Energy applications—as well as the largest producers of Geiger Counter tubes—Anton Electronics could make no compromise with quality. "We knew Sel-Rex was *the* best", says Mr. Weinman, "and after installation we proved the truth of the adage 'the best costs less', in the long run".

The patented AUTRONEX ACID GOLD ELECTROPLATING PROCESS has production-proved its unique advantages for over two years in the plants of leading manufacturers the world over. AUTRONEX can help you make a better, more reliable product—probably at far less cost than with any gold plating formulation you may be presently using. Evaluate AUTRONEX ACID GOLD ELECTROPLATE in your own plant, on your own products. We'd be happy to plate sample parts for you at no obligation. Write... Wire...'Phone. We'll make all the arrangements.

*Trademark for Sel-Rex patented Acid Gold Electroplating Process

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NUTLEY 10, NEW JERSEY

World's largest selling precious metal plating processes Gold, Rhodium, Platinum, Palladium, Silver—Processes for 'Custom' Alloys

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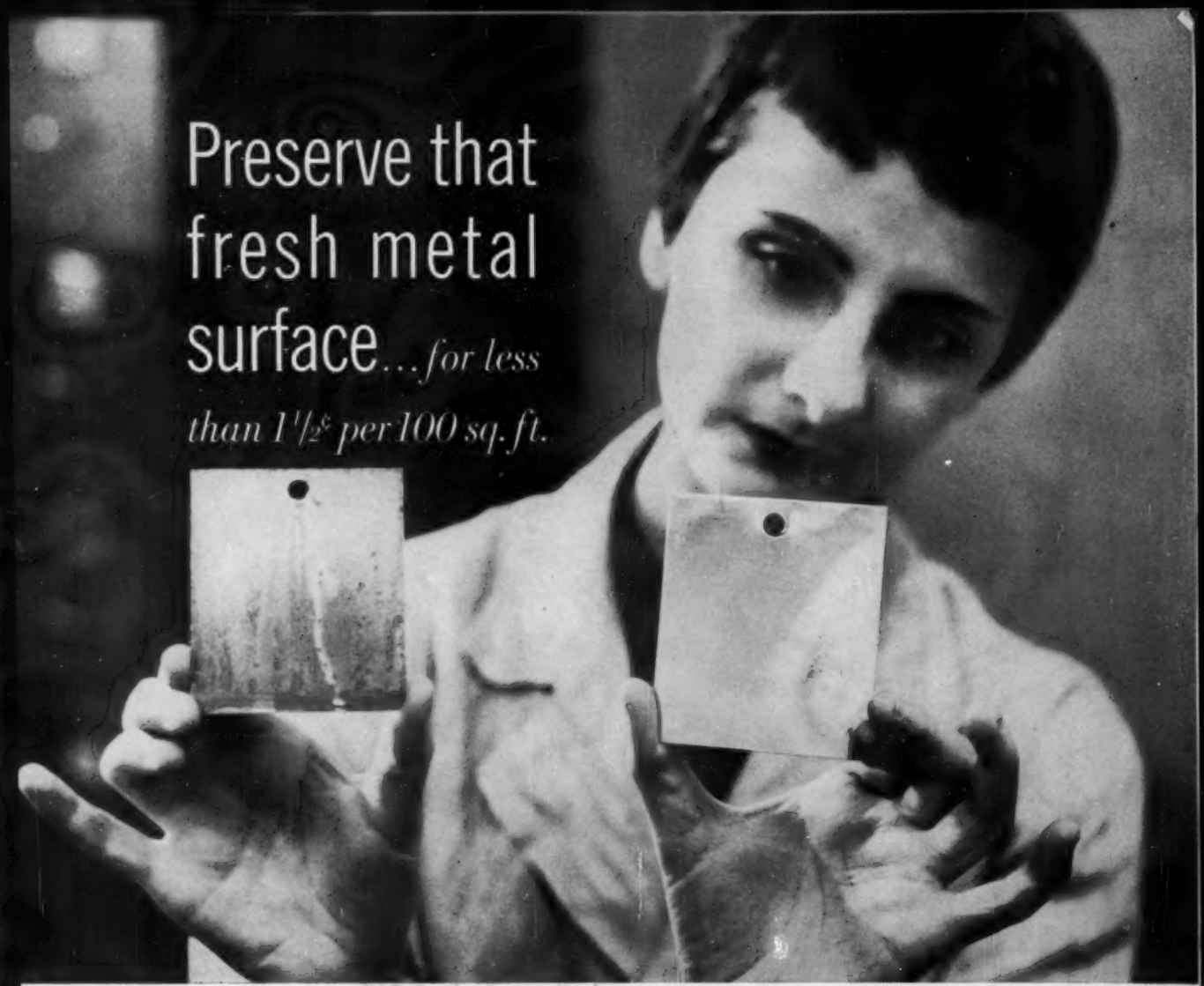

Compare treated vs untreated brass panels. After cleaning, panel on right was rinsed in Entek 45 rinse; panel on left, in standard hot water rinse. Then panels were exposed to 100% humidity at 100° F. for 100 hours. Note how Entek 45 preserves "that fresh metal surface."

From Enthonics research come Enthone Enteks, a new series of rinse water additives which coat metal surfaces with an "invisible shield" against the atmosphere. Entek 45 assures faster drying, eliminates water spots and provides lasting corrosion protection to all metals. Entek CU-55 prevents tarnishing and spotting out of copper and brass even under tropical humidity conditions.

By adding Entek 45 to your final hot water rinse, you can prevent white salt corrosion of zinc and aluminum, prevent yellowing of nickel plate, prevent tarnishing of copper and brass, prevent black spots on cadmium plate.

By treating copper and brass goods or copper or brass plated items with Entek CU-55 you can prevent tarnishing, green salt formation, spotting-out and pit corrosion under high humidity storage conditions.

Entek protection lasts for months, yet costs less than 1½¢ per 100 sq. ft. to treat your parts, less than ½¢ per gallon to make up an Entek 45 solution!

Entek 45 produces an invisible, water-repellent organic film on the metal surface which sheds water rapidly and promotes stain-free drying. This same film acts as an invisible barrier between the metal and the moisture and oxygen in the air.

Entek CU-55 reacts with copper and copper alloys to form an invisible layer which has many times the corrosion resistance of bare copper and brass. Additionally, this layer has better solderability and improves adhesion of lacquers and enamels.

Write today for complete literature on both of these products to Enthone, Inc., 442 Elm Street, New Haven, Connecticut.

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A Subsidiary of American Smelting and Refining Company

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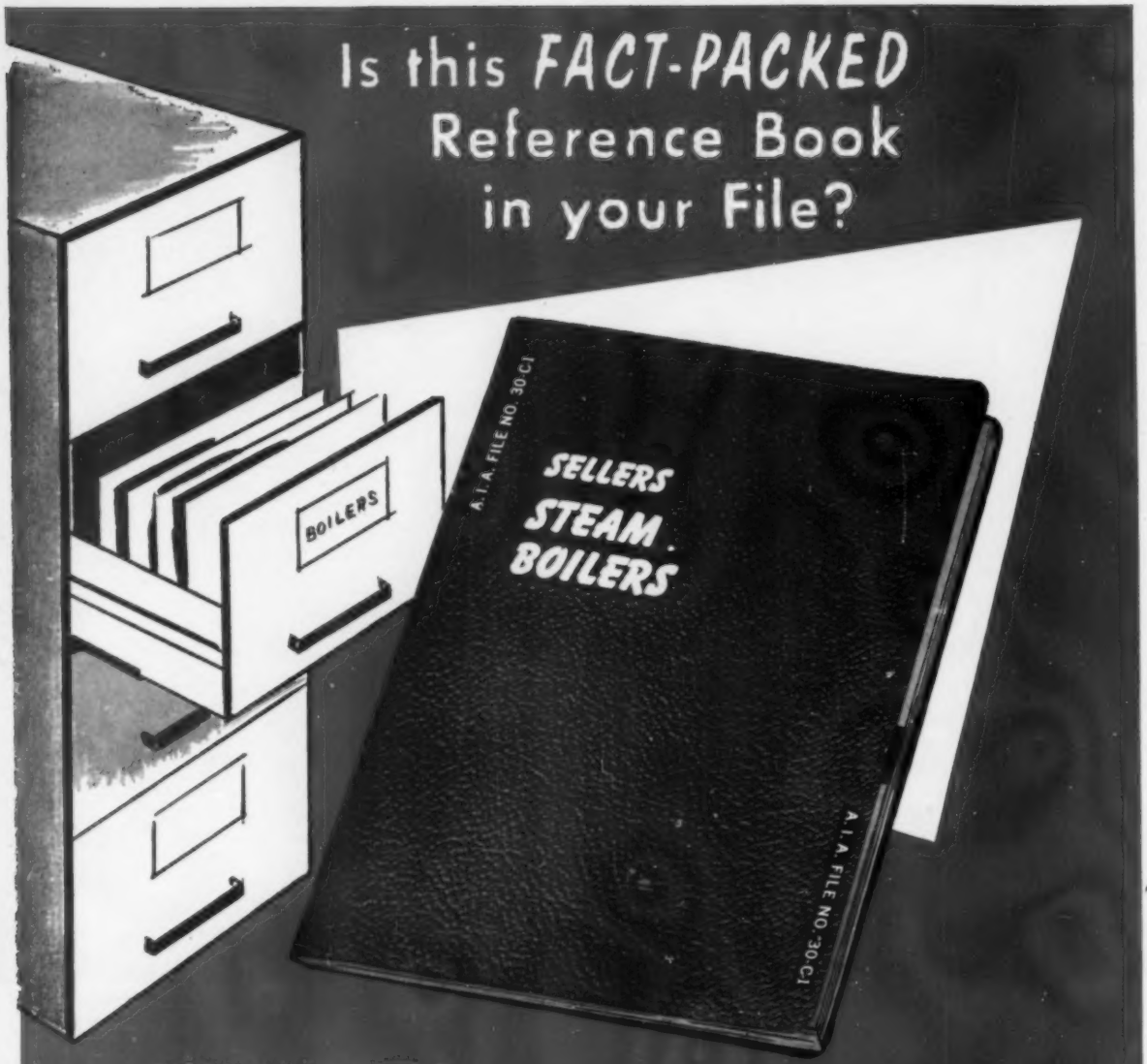

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- Overcoming Building Vacuum and Chimney Back Draft
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plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

MAY 1960 — **Vol. 47, No. 5**

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EDITORIAL

AES MEMBER AND THE OPPORTUNITY TO INVEST HIMSELF FOR LARGE STAKES

ADVANCEMENT OF THE arts and sciences of electroplating, metal finishing and allied arts in general by stimulating the scientific and technical knowledge of the host of AES members who, as individuals, comprise the industry in various capacities, that's the business of American Electroplaters' Society, Inc. (AES).

For over half a century, the Society has concentrated upon that purpose. To that goal, AES has mounted a successful Research Program featuring research projects conducted at various American and Canadian foundations and universities, each focussed upon shedding necessary light upon specific technical and scientific subjects involving plating and metal finishing. To that objective, AES, furthermore, has already conducted 46 annual conventions whose prime target was educational enrichment of AES members. To that mission, it has chartered and coordinated and fathered and nourished 58 separate Branches and six Regional groups each of whose fundamental reason for existence is to expand the technical knowledge of Branch members and consequently enhance their self-improvement. For the good of the whole AES cooperative educational enterprise, the AES publishes PLATING MAGAZINE—and TECHNICAL PROCEEDINGS—and fosters a large and swelling complement of other educational media and tools.

People have made the AES cooperative educational enterprise successful over a stretch of fifty years plus. Dedicated men have collaborated to guide it and to develop it, step by step. At both national and local levels, devoted men have provided the thinking and planning and sweat and toil that have enabled the AES educational craft to progress, in rough as well as serene seas, over a half-century's span. The cooperative effort has, therefore, not only provided ways and means to progressive men for technical and scientific growth but has also enabled them to develop such priceless personal equipment as leadership and statesmanship.

About development of such talents, AES's new gatefold Branch membership promotion leaflet says this:

> Each Branch has its own elected Branch officers and its own appointed functional Branch Committees. Branch members consequently benefit from Branch membership not only through its educational, fellowship and relaxational activities, but also by the opportunity afforded them through Branch office or Branch Committee service to develop leadership, administrative, public speaking, parliamentary and other such priceless talents.
>
> National AES Committees, moreover, are manned by appointed qualified Branch members, and these Committees provide even further and broader means to Branch members for self-development through service. Beyond Branch office, furthermore, there is National AES office, election to which any AES Branch member in good standing can aspire on the basis of maturity and seasoned qualifications.

Here, therefore, lies opportunity to every AES member in good standing to share in escorting AES to its even greater destiny ahead. To those who invest themselves, and who fortify their effectiveness by genuine effort to improve their leadership, administrative, public speaking, parliamentary and other such invaluable talents, the exhilaration of accomplishment and the rewards of self-betterment will surely be stakes worth attaining.

Herberth E. Head

Immediate Past President
American Electroplaters' Society, Inc.

Select-O-Matic

MULTIPLE PROCESS PLATER

Up to 5 or more process cycles ...at the same time ...on one machine ...automatically!

- √ Fully automatic plating at its best . . . efficient, convenient, profitable!
- √ A single Select-O-Matic plater carries any variety of work pieces completely through 2, 3, or any other number of process cycles *simultaneously*.
- √ The operator, at the loading station, simply sets a dial on each carrier to select the process cycle for individual racks. The rest is entirely automatic while the racks travel from start to unloading.
- √ With a Select-O-Matic, different machines for each cycle are unnecessary. Saving in equipment is tremendous. Maintenance is cut to a fraction. All the floor space saved can be put to more productive use.
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ATTACH TO COMPANY LETTERHEAD

Let us have information on the fully automatic Select-O-Matic.

Name.....

Title.....

PICTURED above is the two-tone cover of a new booklet. PLATING MAGAZINE is mighty proud of it. It is intended for YOU the advertiser. It was tailored for YOU—and its purpose is to serve YOU.

YOU the advertiser, as a merchandiser channeling products to market for popularization and sale, are interested in any monthly magazine serving the electroplating, metal finishing and allied arts field for ONE reason and one reason ONLY, namely its demonstrable qualifications to bring the sales promotion story of YOUR products effectively to market. As an advertiser, YOU are interested in PLATING MAGAZINE, for instance, wholly for this purpose—and that's the basis upon which PLATING MAGAZINE is, in turn, interested in YOU the advertiser.

That's why PLATING MAGAZINE has published the little booklet whose cover is pictured above—so that, from its illustrated, simply written pages, YOU the advertiser can glean all the information that you need to determine for yourself as to whether or not it is of DOLLARS and CENTS importance to YOUR company to employ PLATING's advertising columns, regularly and to maximum extent.

Copies of the booklet have issued, or will soon issue, to a large number of representative companies and their advertising agents, with whom PLATING MAGAZINE already enjoys a mutually esteemed relationship, or with whom PLATING desires to create such a relationship. If through some mischance, YOUR copy has not yet reached you, do please write us. (PLATING MAGAZINE, American Building, 443-445 Broad Street, Newark 2, N. J.)

Without obligation or cost to you of any sort, a copy will promptly be sent because, as said, the friendly primer was conceived, written and published by PLATING MAGAZINE exclusively to serve YOU the advertiser.

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SHALLOW SHAPES

SPECIAL SHAPES

Any unusual shape plates brighter and smoother with new, improved

COPPER-LUME

Bright copper plating of "problem" shapes *used to be* a tricky operation! Now, you can give *any* shape a bright, dependably uniform copper finish with COPPER-LUME, the remarkable new bright cyanide copper process by H-VW-M.

COPPER-LUME deposits a uniformly bright coat that makes an ideal base for nickel-chromium deposits. And, whenever required, COPPER-LUME buffs beautifully to maximum brightness in minimum time!

Want to know more about better copper plating with COPPER-LUME? Write today for complete details.

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COPPER-LUME—U.S. PATENTS 2881121, 2881122

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CORROSION RESISTANT

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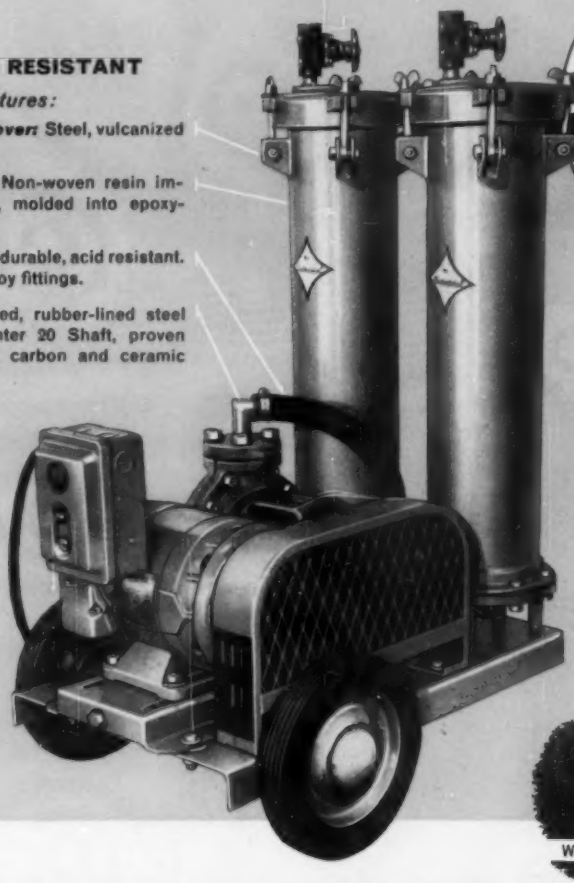
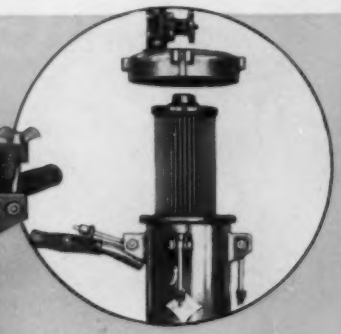
Filter Element: Non-woven resin impregnated fabric, molded into epoxy-phenolic ends.

Hose: Three ply, durable, acid resistant. Plastic or Hastelloy fittings.

Pump: Vulcanized, rubber-lined steel chamber. Carpenter 20 Shaft, proven mechanical seal; carbon and ceramic components.



1200 GPH



EASY TO CLEAN
Flip-top cover lifts off. Pull-out cartridge can be replaced or rinsed and reused in seconds.

100% PORTABLE
Mounted on two 6" dia. wheels. Full swivel rear coaster insures complete ease of movement.

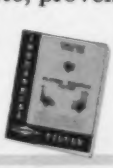
COMPACT
Is complete filtration *system:* suction and discharge hose, ball check foot valve strainer; motor with thermal overload starter, filter element(s) and pump . . . yet requires only 6 sq. ft. of floor area. You simply plug it in . . . and start filtering, anywhere.

Now you can eliminate the time and expense of bothersome repiping and the need and equipment for separate plating solution filtering stations.

The new type 118 *heavy duty* Industrial filters are rugged, but compact; low in cost but typically *Industrial*-engineered and rubber-lined throughout for corrosion resistance. The heavy duty *Industrial* pump is of the same long proven design employed in hundreds of *Industrial* filters now in plating service.

Look at the features . . . look at the specs . . . look at the *work* capacity. You can get this complete, proven-dependable filtration system in but six *portable* square feet of work area.

WRITE FOR BULLETIN 118.



TWO MODELS AVAILABLE
Single tube 600 gph capacity, is convertible to double tube 1200 gph capacity model shown above.

600 GPH

CHECK THE SPECS:

- 600 and 1200 gph capacity
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- Temperatures to 170° F.
- Unit 50 P.S.I.G. operating pressure
- Fully proven in plating use

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P-659

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Long will her trim stay bright and shiny! For under that mirror-like top coat of chrome on the 1960 Dodge there's a double layer of Nickel Plating.

The first is a heavy layer of semi-bright Nickel – to provide a leveling base, a smooth metal foundation. The second is a fully bright layer to provide the lustrous base needed for a gleaming chrome finish.

It's the double layer of Nickel that actually makes possible the lasting brilliance of the finish. You see, double-layer Nickel Plating works two ways: It acts as a *cushion* against nicks, scratches and abrasions. What's more, it *shields* the basis metal against rust and corrosion.

It's truly "The Finish of Lasting Beauty." So rich and lustrous, it's bound to earn an appreciative nod from the prospective buyer . . . so durable and practical, it keeps untarnished a manufacturer's reputation for quality.

With Nickel in ample supply, now is the time for you to look into the advantages of double-layer Nickel Plating. Plan to recommend and use this quality finish whenever a durable and attractive finish is needed.

For information on corrosion testing of plated coatings and how it can help assure the quality of Nickel-Chrome finishes, write for our booklet, "Corrosion Testing of Electrodeposited Coatings." It's yours for the asking.

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO **Inco Nickel** ... *makes plating perform better longer*

Production line economy

plus first line quality...

yours in the New 60-H silicon rectifier

The new Udylite 60-H rectifier has been designed to give you *all* the features you want in a low cost standard package. Production economies gained from strict standardization, and adherence to a specific range of sizes are being *passed along to you.*

There is no deviation from traditional Udylite quality. Finest construction and materials prevail throughout the 60-H series. These rectifiers have *all* the outstanding features of Udylite's Udysil rectifier series with individual diode and instantaneous DC overload protection.

A range of ten voltage/amperage combinations provides a unit of the right size and capacity to meet almost any normal requirement. If you're interested in quality *and* economy, investigate the Udylite 60-H today. See your Udylite man or write to:

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the udylite corporation • Detroit 11, Michigan

on the west coast: the L. H. Butcher Company

NOW

Alcoa aluminum patented integral web channel bus available in 8 sizes

You can now get **all** the advantages of aluminum integral web channel bus in a new broad range of sizes.

This patented* design, introduced by Alcoa in 1956, has been expanded to eight sizes, providing capacities from 2,800 to 12,000 amperes.

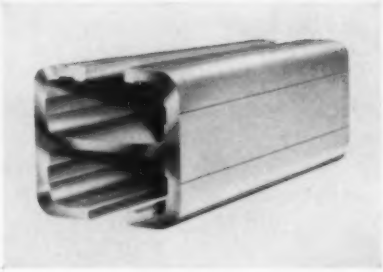
The web construction provides an integral shape for a bus conductor having unusual mechanical strength and high electrical efficiency. The large section modulus offers high structural strength to resist external loading and short-circuit stresses. The economical disposition of metal provides high current-carrying capacity at a low cost.

Moreover, you can make joints, taps, and splices by clamping, bolting, or welding. The table shows the sizes, capacities and weights from which you can choose to meet your exact needs.

Additional sizes can be designed to meet other specific needs. For complete information, contact your Rome representative. Or, if you'd like a copy of our "Alcoa Aluminum Bus Conductor Handbook," write: Rome Cable Division of Alcoa, Dept. **20-50**, Rome, N. Y.

*PATENT NO. 2,904,621

Size	Nominal Current† (amperes)	Wt./ft. (lbs.)
4 x 4	2,800	5.4
4 x 6	3,500	7.1
5 x 6	4,050	8.9
5 x 8	5,000	11.7
6 x 6	5,000	14.2
8 x 8	7,000	19.0
11 x 11	10,000	31.0
12 x 12	12,000	38.0



†Based on 30°C rise above 40°C ambient still air

ROME CABLE
DIVISION OF **ALCOA**

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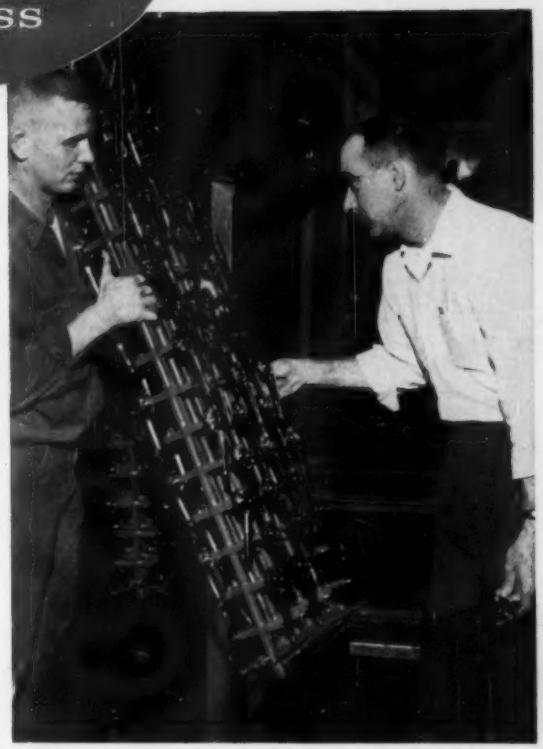
udylite

Bi/NICKEL

PROCESS



proves "seaworthy" ...provides a better way to make marine hardware

A knotty problem has been solved for the Middleville Engineering and Manufacturing Company, makers of Jervis marine hardware, with Udylite Bi/NICKEL. Now die castings, automatically plated with Bi/NICKEL, are replacing the more costly brass used in the manufacture of boat fittings.

Costs have been materially reduced. More intricate and beautiful shapes are possible. And, with Bi/NICKEL the manufacturer is able to produce a finish that more than meets the exacting requirements of the product.

Udylite Bi/NICKEL has proved as effective afloat as ashore where it has already met the CASS and Corrodkote test requirements. Highly resistant to the corrosive effects of salt sea spray, Bi/NICKEL is the ideal finish for marine hardware that looks better and stays looking better longer.

Your product too, may benefit . . . your production problem may be solved with the application of Udylite super bright Bi/NICKEL. Inquire today of your Udylite man or write directly to:

the udylite corporation

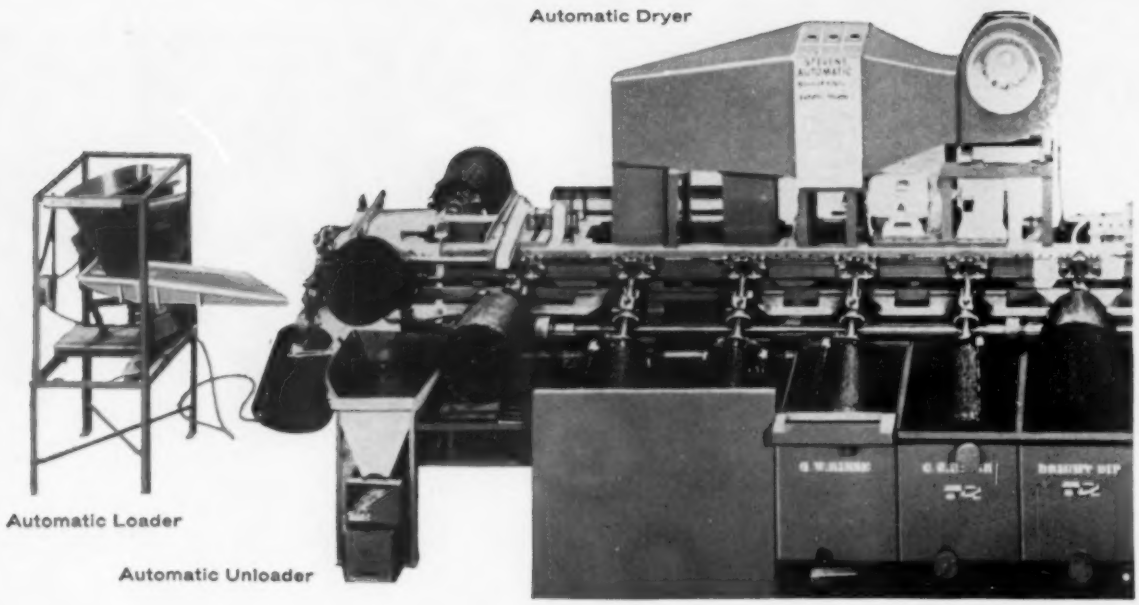
world's largest plating supplier

Detroit 11, Michigan

on the west coast: the L. H. Butcher Company

every 16 hours 2 million pounds of small parts are being plated or processed*

in STEVENS AUTOMATIC BARREL MACHINES



*WASHING, BURNISHING, PHOSPHATING, BRIGHT DIPPING

It's a fact! Every working day a tremendous tonnage of small parts is being plated or processed in Stevens Automatic Barrel Machines. Why? Because Stevens builds the only barrel machine on the market today that provides complete automation.

AUTOMATIC LOADING...AUTOMATIC UNLOADING ...AND AUTOMATIC DRYING . . . are all within the machine. No extra equipment or floor space is required! When you think of truly automatic plating or processing, think of Stevens. Only Stevens can give you—

COMPLETE AUTOMATION • LOWEST COST PER PIECE
EXTRA SIMPLICITY OF OPERATION AND MAINTENANCE
EXTREME MECHANICAL FLEXIBILITY

Write today for complete information on this processing profit-builder.

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

Lustrous appeal in lamp components. A New Jersey job plating shop uses BURNEK 22 for bright burnishing lamp parts after brass plating. Parts are ball and self burnished for 30 minutes, rinsed, dried, and lacquered.

Bright, stain-free handbag parts. A company making handbags and pocketbooks uses BURNEK 22 for burnishing small steel frames, corners, and ornaments before bright nickel and gold plating. Parts are then rinsed and dipped in dilute sulfuric acid.

Clean, scratch-free zipper pulls. A large Eastern zipper manufacturer uses BURNEK 22 in open-end oblique barrels to remove stamping oil and bright burnish brass and steel parts. Parts are then ball burnished 45 minutes.

Burnish parts mirror-bright at low cost with BURNEK 22!

Brass, copper, nickel, silver, gold – you name it, Wyandotte BURNEK® 22 can burnish it to a bright luster with exceptional savings! Even handles short runs on aluminum, zinc, steel, and stainless-steel parts.

Most important, BURNEK 22's low cost and short running time help you slash burnishing costs to the bone. So why wait? Call your Wyandotte representative for a revealing demonstration in your own plant. Do it today!

Wyandotte Chemicals Corporation, Wyandotte, Michigan, Also Los Nietos, California, and Atlanta, Georgia. Offices in principal cities.

Wyandotte CHEMICALS

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The Best in Chemical Products for Metal Finishing

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For the brightest electroplating

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS

Three stages in finishing a zinc base die casting. Buffed part (center) is followed by electrocleaning in Oakite 195 (right). Hand holds plated part. Notice how electrocleaned part at right retains all the luster and color of the buffed part.

New Oakite electrocleaner assures brighter plate, fewer rejects for zinc die castings

It's non-etching and non-discoloring—that's why new electrocleaner Oakite 195 assures a brighter chromium luster, fewer plating rejects. Used with direct, reverse or periodic reverse current, it removes soils without dulling or darkening the buffed surface. It makes plating of zinc die castings a more dependable, more economical operation. Proof? Many users report *no* rejects due to poor electrocleaning *for the first time* in their experience.

Oakite 195 rinses easily, too, and has low foaming tendencies. Works well with copper and brass alloys, steel, lead and brittania metal, as well as zinc, making it ideal for service where several metals are cleaned in the same bath.

It's an excellent, profit-boosting material, but it's only *one* of a whole Oakite line. Ask the Oakite man to help you select the electrocleaner that gives you the brightest parts along with the brightest profit-picture. Or, write for Bulletin F-10466. Oakite Products, Inc., 40 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

SCIENCE

over 50 Est. 1909 years' leadership in industrial cleaning

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. . . with TUMBLEX abrasives*

. . . and you get them fast, too

To give parts, ranging from tiny needles to hefty castings, a fine, uniform finish — and to save substantially on all your finishing jobs — make sure you:

Combine the right barrel finishing techniques with abrasives that perform best—and are delivered to you fast.

From Norton you can get the broadest range of top-performing barrel finishing abrasives. For quick shipments complete stocks of the following TUMBLEX abrasives are maintained at Worcester: random shaped "A" in 14 sizes . . . bonded "T" triangles in six sizes . . . bonded "S" spheres in five sizes . . . bonded "RP" round pins in two sizes . . . bonded "TP" triangular pins in one size . . . "N" natural stones in seven sizes.

You get further assurance of prompt deliveries to help you avoid production delays. Adequate stocks of the most popular TUMBLEX abrasives are kept at your nearest Norton branch warehouse or at your distributor's.

Send samples of your work to our Sample Processing Department. We'll barrel finish, return samples and report the methods and abrasives you need for better, lower cost finishing. NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

*Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

G-387

75 years of . . . Making better products . . . to make your products better

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LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

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Process Engineered
SILICON RECTIFIERS

Designed to match a process—not to meet a price!

Wagner Rectifiers are process engineered . . . designed to give uninterrupted power that correctly matches your particular process, thus assuring highest efficiency from both the equipment and process.

In addition to this basic process-engineered design, Wagner Rectifiers have important engineering features which make them far superior to anything on the market . . . yet they are priced competitive to comparable quality.

INSIST ON THESE 5 WAGNER FEATURES IN YOUR NEXT RECTIFIER:

1. **CUSTOM BUILT**—to do more than just meet your routine power needs . . . they're built to take the unexpected that occurs in every shop. Momentary extra heavy loads and short circuits are completely and harmlessly absorbed—without cell failure and without shortening rectifier life.
2. **MORE RECTIFICATION AREA**—twice the number of cells found in ordinary rectifiers, with each cell having over 2½ times the usual rectification area. This gives you a more uniform power supply . . . fewer operating troubles with maximum efficiency!
3. **UNIQUE COOLING SYSTEM**—a special-type blower and strategically located baffles force pressurized air directly across the cells, assuring longer cell life and highest possible cell efficiency.
4. **OVERLOAD PROTECTION**—our exclusive built-in protective devices shut down the rectifier before highly unusual overload or other dangerous situation causes damage to the cells.
5. **RUGGED COMPONENTS**—Wagner-built transformers have Class B insulation (inorganic materials) . . . exposed bus bars are silver plated . . . housings are ruggedly built . . . meters are shielded to protect their precision accuracy.

Wagner Silicon Rectifiers are available in capacities ranging from 500 to 50,000 amperes with full selection of controls for manual or automatic regulation. Wagner Selenium Rectifiers also available in the same range of capacities.

Ask your Allied Field Engineer about the many advanced features of Wagner Rectifiers and how they can benefit you in your operations. You'll find his name listed under "Plating Supplies" in the yellow pages. Or, write for FREE TECHNICAL DATA FILES.

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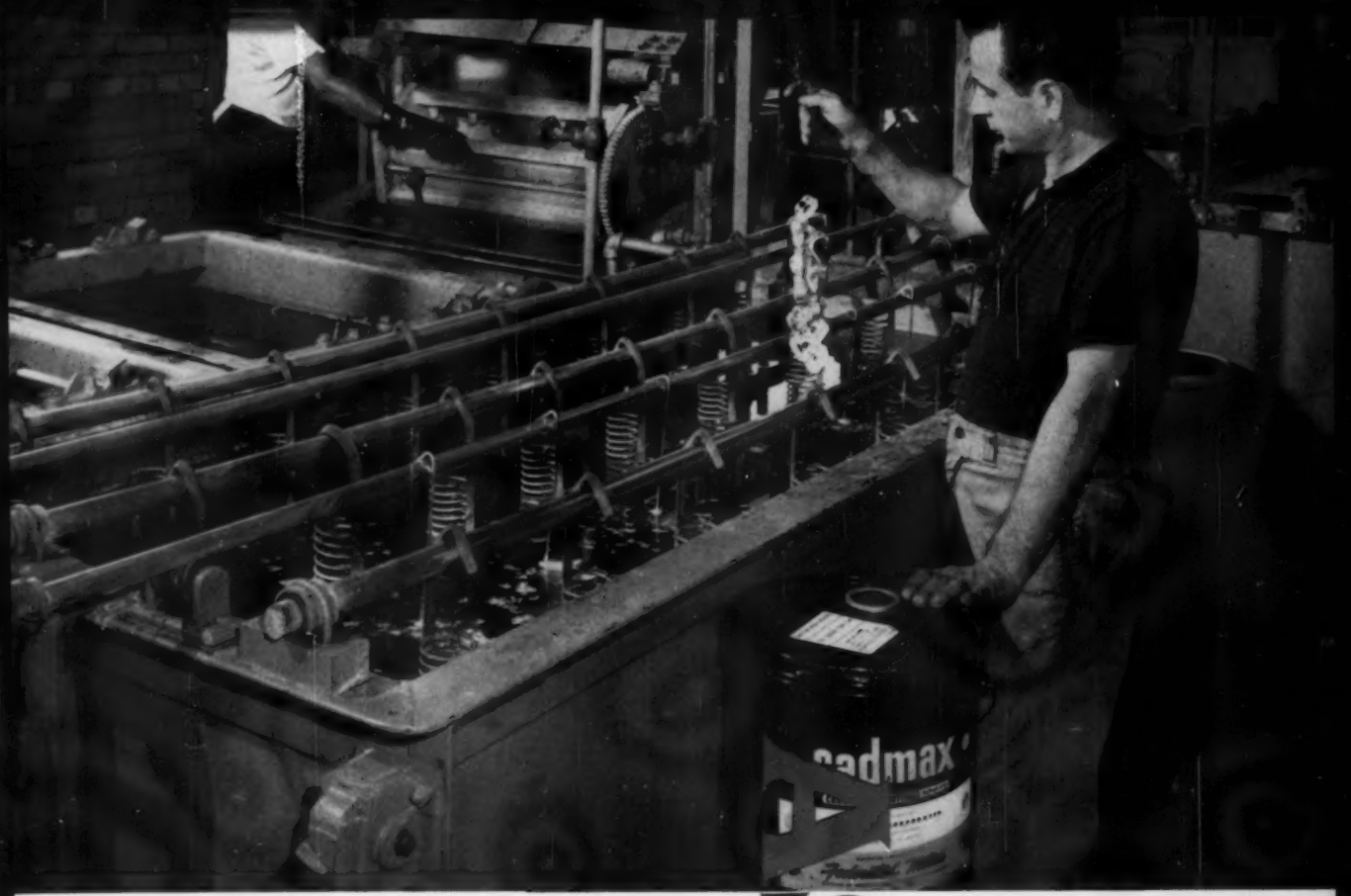

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You can guarantee consistent high grade results with Federated plating materials, developed, perfected, and competitively tested and proven. In addition to standard brass, cadmium, copper, lead, nickel, tin, tin-lead, and zinc anodes, there are new **Asarcomax** copper anodes and triple-life Conducta-Core lead anodes. **Cadmax** (cadmium), **Zimax** (zinc), **Levelmax** and **Nimax** (nickel), brighteners have set industry standards for performance. Federated nickel salts are of the highest purity and uniformity. Write or call for full information to Federated Metals Division, American Smelting and Refining Company, New York 5, RE 2-9500, or call our nearest sales office, or get in touch with your nearby Federated Plating Materials Distributor

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SUPERLUME
THE PREMIUM BRIGHT NICKEL BATH

we admit it...there may be other baths as bright as H-VW-M Superlume

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IS THE MOST DUCTILE AT HIGHEST LEVELLING

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Sure, it costs a little more than conventional bright baths—but no more than other baths that are almost as good as fast plating Superlume. Why not get the best! Write or call for full details.

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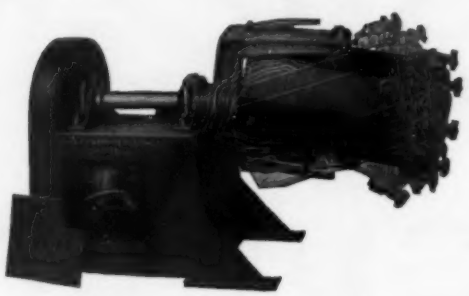
Independent spindles—each with separate patented Variable Speed Drive and controls — ball-bearing throughout. Powered by two up to 15 H.P. motors. Adopted by leading manufacturers as standard equipment.

TYPE L — DOUBLE ACTION BARREL For ABRASIVE TUMBLING or BALL BURNISHING

The cylinder can be operated at an angle for producing a double tumbling action—thus producing a better and more uniform finish in a much shorter time.

Longer pieces finished more uniformly and without bending.



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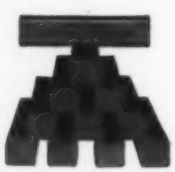

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THEY CUT
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THE ANSWER TO INCREASED PRODUCTION AT LOWER COSTS

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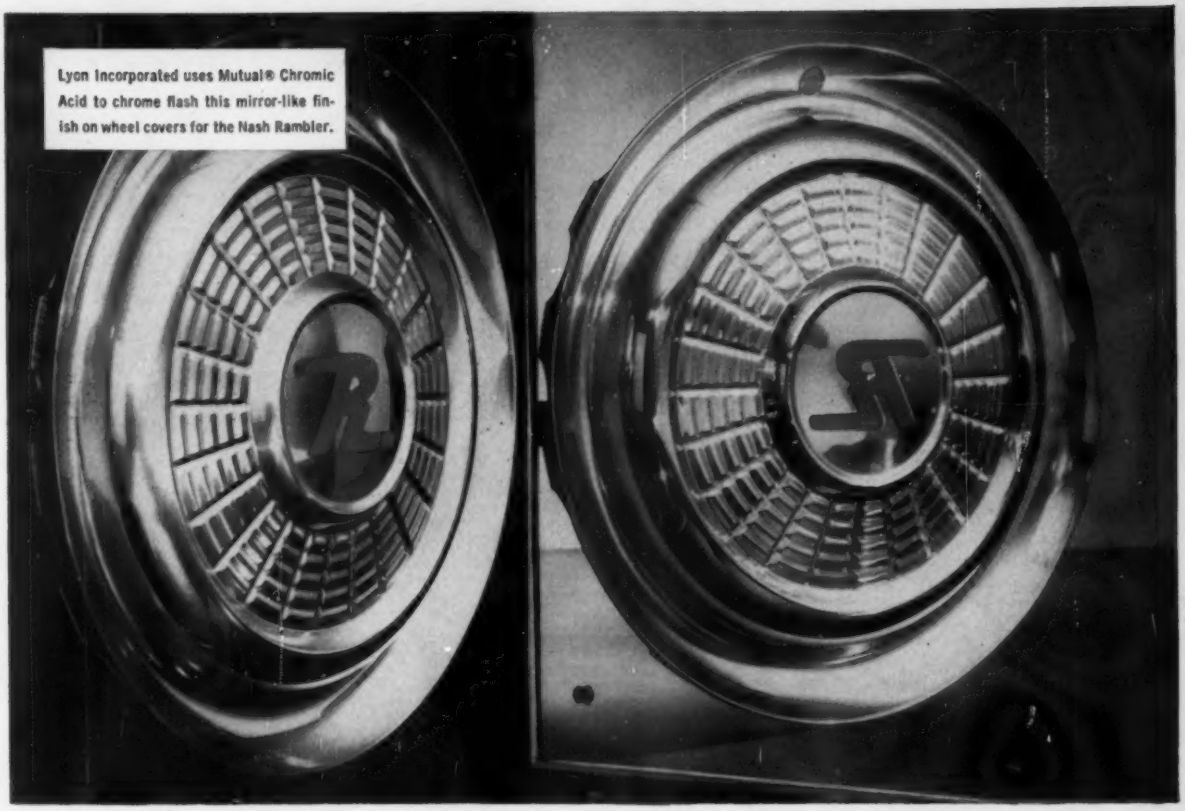

Lyon Incorporated uses Mutual® Chromic Acid to chrome flash this mirror-like finish on wheel covers for the Nash Rambler.

MIRROR FINISH OVER STAINLESS!

Chrome flashed by skilled plater using MUTUAL CHROMIC ACID

Experienced platers, like Lyon Incorporated, rely on high purity Mutual Chromic Acid to produce chrome plate that's decorative and durable. Combining careful control and plating skill with Mutual Chromic Acid, Lyon produces a mirror-like finish on wheel covers for the Nash Rambler. The plating is done over 301 Stainless Steel in a bath of slightly lower acid-sulfate ratio than that used for chrome plating over nickel.

Mutual Chromic Acid is always 99.75% pure—or better. Its low sulfate content (less than 0.1%) makes it easy for you to control the acid-sulfate ratio of your plating bath. This safeguards against plating difficulties—and expensive rejects!

For technical information about Mutual Chromic Acid, send coupon for our free booklet, "Chromium Chemicals." Our Technical Service Staff will also be happy to answer your questions.

OTHER PRODUCTS FOR PLATERS

SOLVAY® Ammonium Bicarbonate • SOLVAY Caustic Soda
SOLVAY Hydrogen Peroxide • SOLVAY Methylene Chloride

Allied Chemical

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MUTUAL chromium chemicals are available through dealers and SOLVAY branch offices located in major centers from coast to coast.

SOLVAY PROCESS DIVISION 70-50
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☐ Send Bulletin 52 "Chromium Chemicals"
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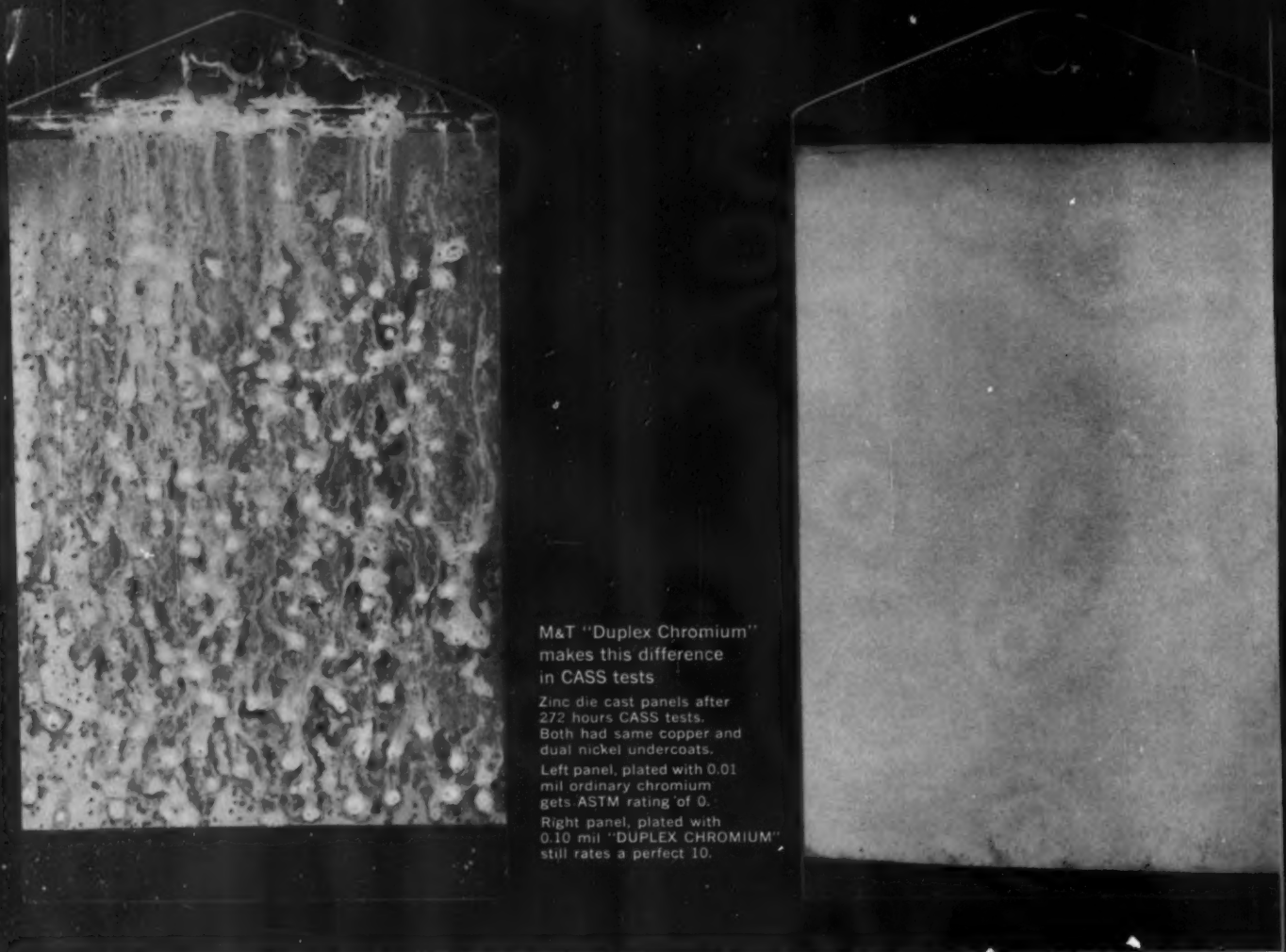


M&T "Duplex Chromium" makes this difference in CASS tests

Zinc die cast panels after 272 hours CASS tests. Both had same copper and dual nickel undercoats.

Left panel, plated with 0.01 mil ordinary chromium gets ASTM rating of 0.

Right panel, plated with 0.10 mil "DUPLEX CHROMIUM" still rates a perfect 10.

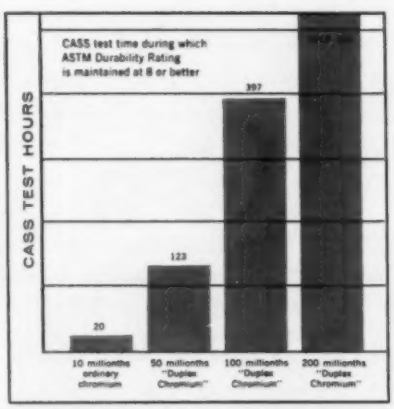
The thicker the "Duplex Chromium" ...the longer the plating lasts

HOURS that plated samples survive in CASS* tests indicate life expectancy outdoors. The results of this modern corrosion test prove that M&T "DUPLEX CHROMIUM" radically increases protection . . . and the *thicker* the chromium the *longer* the finish lasts.

Here then is the best way to upgrade durability of chromium plated steel and zinc die cast parts. You'll get dramatic improvement with a 0.05 mil thickness of M&T "DUPLEX CHROMIUM." And you can provide even more remarkable life with 0.10 mil.

For plating thicker chromium, Unichrome SRHS® Chromium baths have no equal. They alone give the right type of deposit. They speed production, simplify it. M&T "DUPLEX CHROMIUM," using two of these baths, consists of a layer of Crack-Free Chromium topped by another special layer of SRHS® Chromium that minimizes localized corrosion due to tiny imperfections in the basis metal. You also assure more uniform plate distribution, so that recesses, too, get amply thick deposits without burning on edges. Send for data or for an M&T plating engineer.

*Copper accelerated acetic acid salt spray test


CASS TEST HOURS
CASS test time during which ASTM Durability Rating is maintained at 8 or better
20
123
397
10 millionths ordinary chromium
50 millionths "Duplex Chromium"
100 millionths "Duplex Chromium"
200 millionths "Duplex Chromium"

Graph indicates how corrosion resistance of chromium plate and ability to maintain ASTM durability rating of 8 or better in CASS testing increases with thickness. All test panels had 0.75 mil copper and 0.75 mil nickel; only the chromium was varied—with results as shown.

plating products

METAL & THERMIT CORPORATION
General Offices: Rahway, New Jersey
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A new idea in plating

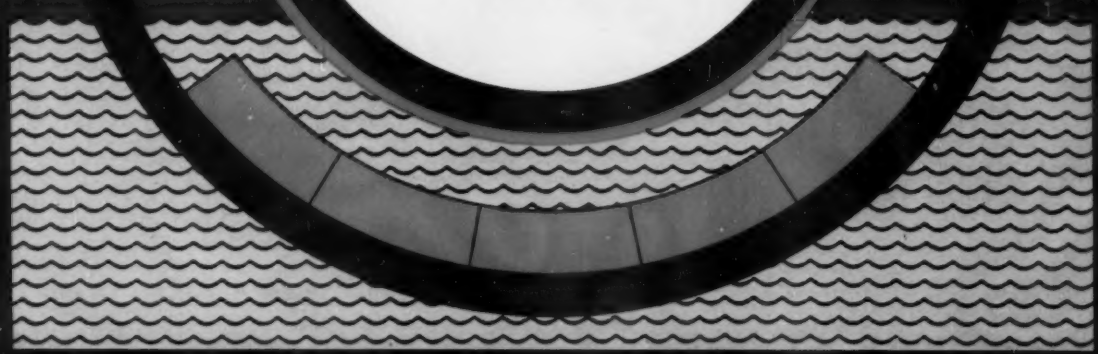
ANACONDA

announces

"PLUS-4"

phosphorized copper anodes

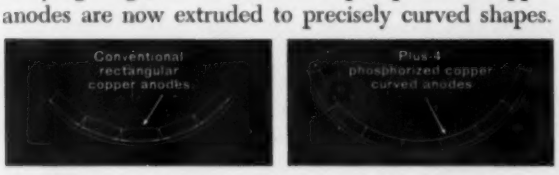
in a new form



CURVED ANODES

for plating cylinders faster and more uniformly

To make anode surfaces parallel the rotogravure cylinder being plated, and to fit the curve of the current-carrying slings, Anaconda "Plus-4" phosphorized copper anodes are now extruded to precisely curved shapes.



This design gives both cost savings and improved cylinder quality:

1. A more evenly plated cylinder. Because the distance between the cylinder and the anode surface is more uniform, the copper deposit is smoother and more uniform.

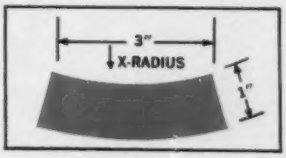
2. Finishing operations in most cases are reduced, as much as 50%, because of the uniform copper deposit.

3. Less scrap because anodes corrode more evenly.

4. Improved electrical efficiency and faster plating because of better contact with sling.

For more information, write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 60107

Note: When you request information, please specify inside radius of anode.



"PLUS-4"® phosphorized copper anodes

ANACONDA®

products made by The American Brass Company

Here is a sampling of CLEPO soak cleaners available for general purpose use and specific application.

WHAT'S NEW IN SOAK CLEANERS?

For removing oils and other lubricants from steel. Excellent emulsifying properties.	CLEPO 26-E
For cleaning oil and shop dirt from steel, copper, brass. General utility cleaner.	CLEPO 36-K
For removing buffing compounds, oil, shop dirt and sulfurized oil from all metals. Can be used cold.	CLEPO 135-H
For removing oil, lettering, sulfurized oil and buffing compounds from aluminum and zinc without attack.	CLEPO 86-P
For removing buffing compounds from all metals.	CLEPO 90-J
For removal of drawing compounds from aluminum and heavy oils from all metals prior to alkaline cleaning. Can be used cold.	CLEPO 8-S
For cutting sulfurized oil, grease, buffing compounds for removal in a subsequent soak cleaning operation. Solvent cleaner. Contains no chlorinated compounds.	CLEPO COLD DIP B

Soak cleaners are among the most widely used types of cleaners and every day new ones are being developed to meet the requirements of new applications. How to remove a special oil, other lubricants, a newly developed buffing compound or similar soils most effectively and economically are problems which your CLEPO technical representative and the Frederick Gumm laboratory staff have been solving for many years.

The results: a broad line of both general purpose and specific soak cleaners for your selection plus the ability and experience to design effective new cleaners when required, at a minimum of time and cost to you.

Send for Technical Bulletin 360

FGE-5

FREDERICK GUMM CHEMICAL COMPANY INC.
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REG. TRADE NAME

NOW * PERMA-D-DIP

PERMA DIP 185 . . . A NEW DIP FINISH FOR ANY PLATING THAT TARNISHES

ONE GALLON SIZE

* ELIMINATES RAINBOWING

PERMA-DIP 185 is a wet dip finish that dries in less than 20 minutes (or force dried in 5 minutes), that absolutely will not rainbow. Send for your test 5 gallon sample.

5 GALLON SIZE

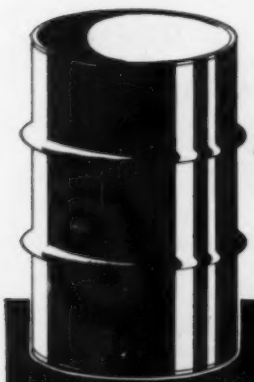
* RESISTS SPOTTING

PERMA-DIP 185 is not a lacquer and will not blush. PERMA-DIP will not turn milky, is non-yellowing and has excellent sulphide resistance.

* CRYSTAL CLEAR FINISH

PERMA-DIP renders a perfectly clear finish that will last indefinitely. The finish is hard and permanent. PERMA-DIP is completely stable.

55 GALLON SIZE



Also available PERMA-DIP 184 for spraying or dry dipping for unexcelled adhesion, sulphide resistance and durability on any plated surface.

* SEND FOR 5 GALLON TEST SAMPLE

U.S. PAINTS

U. S. PAINT LACQUER & CHEMICAL CO.
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Gentlemen: Please forward immediately the order checked below. I understand that we will be invoiced the amount shown plus freight one month after shipment and that if we are not completely satisfied with PERMA-DIP we may so indicate on the invoice and return the invoice to U. S. Paint Lacquer & Chemical Co.

☐ 5 gal. PERMA-DIP 185 @ $14.50
and 1 gal. reducer @ 2.05
$16.55

☐ 1 gal. PERMA-DIP 184 @ $5.25
1 gal. reducer @ 3.10
$8.35

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 523.

ANOTHER NORTHWEST FIRST!

a completely NEW concept in metal cleaning!

- An easy handling liquid.
- Effective on *all* metals.
- Requires NO special tanks or equipment.
- A completely organic product.
- Won't injure rack coatings or work finish.
- Simple positive control.

Alkalume LC-1 is a specially developed immersion-type cleaner for removal of buffing compounds and soil from all metals, prior to plating or anodizing.

It is non-solvent, non-alkaline and not an emulsion. It has the desirable penetrating properties of both alkali and solvent yet affords complete protection for the surface finish.

Alkalume LC-1 is economical, non-toxic and non-volatile, offering long service life and no disposal problem.

Complete details upon request.

The name NORTHWEST means first with the best!

LO-HI pH

NORTHWEST CHEMICAL CO.

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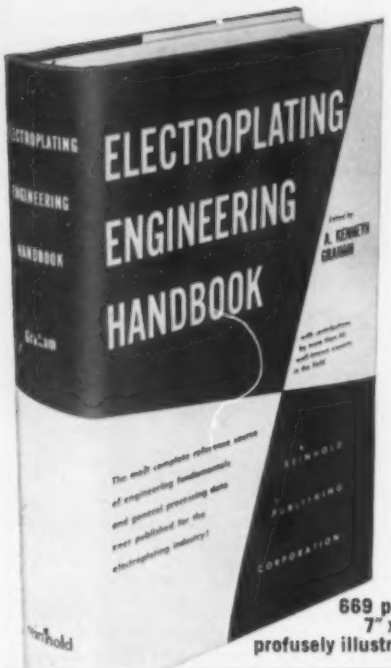
(1) Chairman Walter L. Pinner extending official welcome. Dr. William Blum, AES Scientific Award winner, seated. (2) Crowded auditorium at the first session. (3) Session Chairman T. P. Hoar introducing Dr. Blum, who delivered the first William Blum Lecture.



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NOVEL PROCESS FOR PLATING NICKEL ON ALUMINUM ALLOYS*

by JAMES T. N. ATKINSON**

Following earlier work on electroplating on aluminum from strongly acid solutions, a new process for nickel plating aluminum from sulfate-fluoborate-chloride baths was developed. Adhesion values of about 5000 psi in shear were obtained regularly, and still better adhesion could result from the use of a proper heat treatment. The process eliminates zincate or other pretreatments for all aluminum alloys tested, and appears to have industrial potentialities for general electroplating and electroforming operations with nickel. Analytical Methods are given in an appendix.

INTRODUCTION

In an earlier publication[1], the possibility of obtaining a direct nickel plating on aluminum from acid solution had been noted, following concepts laid down by Burgess and Hambuechen[2] and apparently overlooked by later workers and reviewers. Briefly, this involves development of an acid plating solution of otherwise normal characteristics which is on the threshold of causing corrosion of aluminum alloys under its normal operational conditions.

The particular advantage of this scheme is that a good quality plate can be deposited without requiring zincate or other complex pretreatments. The oxide film on aluminum is presumably thinned in the mild alkaline cleaning step and its remnants are removed cathodically in the initial stages of plating from the acid plating solution employed.

ELECTROPLATING NICKEL ON ALUMINUM

The best solution studied previously contained nickel sulfate, nickel fluosilicate, and boric acid, and operated at *p*H 2.7 or so. In view of the marked similarity between fluoborates and fluosilicates and the much better general plating characteristics of the latter, attempts were made to develop an analogous fluoborate solution.

It soon became apparent that, with precise small additions of chlorides, the fluoborate baths could be made very effective. Considerable work was therefore done to determine the proper operating range of the bath. Fortunately, the preferred composition from the point of view of the cathode also led to very satisfactory and uniform anode corrosion.

The solution composition developed is as follows:

	Preferred	Allowable
Nickel sulfate crystals	200 g	100–400 g
Nickel fluoborate crystals	66 g	132–33 g
Nickel chloride crystals	1 g	¼–1 g
Boric acid	20 g	10–40 g
Water to make	1 liter	1 liter
*p*H	1.0	0.9–1.5
Operating temperature	60C	50–70C

The nickel sulfate and chloride crystals were reagent grade hexahydrates. Nickel fluoborate was a purified crystal supplied by Messrs. British Drug Houses Ltd. Total nickel concentration in the preferred bath was 68 g/l. *p*H may be controlled with sulfuric acid or nickel carbonate.

The functions of the various components appear to be as follows:

The combination of nickel sulfate and fluoborate furnishes the necessary nickel content and conducting ion species. The principal limitations on concentrations are imposed by external factors—the maximum amount of either nickel compound cannot be used with the maximum of the other because of solubility limitations, and too low a concentration of nickel salts could only support undesirably low current densities. The concentration of chloride has to be maintained precisely when aluminum is to be plated to control the aggressiveness of the solution toward aluminum and its oxide film. Boric acid promotes maintenance of a stable bath *p*H in operation.

Broadly similar solutions outside the preferred range can still be employed, particularly if the chemicals used are exceptionally pure. Fluosilicates of sufficient purity may apparently replace fluoborates, but normal purity material can cause trouble. In any event, the solution soon gels and is of no further use. A variety of other halides may replace nickel chloride. The preferred solution is also less satisfactory if operated at *p*H 4; here the usual pretreatment schemes for plating on aluminum must be resorted to for good adhesion.

BATH IMPURITIES AND THEIR CONTROL

Purity of raw materials for this process was found to be important and deionized or distilled water should be used for make-up. Commercial grades of nickel fluoborate and sulfate normally contain sufficient chlorides and copper to require special treatment. The chlorides may be removed by precipitation with silver sulfate, or determined analytically so that due allowance can be made when adding nickel chloride crystals. Copper, and other heavy metals, may be removed by prolonged electrolysis at low current density or by precipitation on scrap nickel. The high sensitivity of the bath to copper makes it wise to nickel plate all copper bus, etc. in the vicinity of the plating tank.

Nitrates, though normally not present in the chemicals used, disrupt the operation of the bath and hence should be avoided. Prolonged electrolysis at low current density will rectify nitrate contaminated solutions. Contamination by organics is objectionable as in normal nickel plating practice, and addition agents such as saccharin and sodium lauryl sulfate appear to have the expected effects on plating characteristics. Treatment with activated charcoal can remove unwanted organic contaminants; use of cellulose base rather than mineral filter aids seems wise in the filtration step.

PROCEDURE FOR NICKEL PLATING ON ALUMINUM

Although the only necessary pretreatment, as in earlier work, was immersion or cathodic cleaning for not more than

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*Canadian Patent No. 590,840, issued Jan. 19, 1960 and other patents applied for, assigned to Canadian Patents and Development Limited.

**In charge of Electroplating Group, Department of National Defence, Defence Research Board, Naval Research Establishment, Dartmouth, Nova Scotia.

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two minutes in a solution of 3 per cent each of trisodium phosphate and sodium carbonate at 60C, other steps were helpful in some cases. Normally, the aluminum alloy was first degreased in a vapour degreaser; treatment in the mild alkaline cleaner followed. At this stage there was some reaction between the aluminum alloy and the alkaline cleaner, and the object was to have the maximum reaction with the cleaner consistent with a smut free surface. If smut formed it would have to be removed e.g., with a dip in dilute sulfuric acid or by brushing. In the case of the copper containing alloys, smut formed rather rapidly in the alkaline cleaner. Here, it was preferable to return the work a second time to the mild cleaner, but only for about ten seconds, following the initial cleaning and sulfuric acid treatment. Following rinsing, the work was ready for plating.

The initial strike on aluminum alloys was made with the preferred composition given above at 30 to 40 amp/ft^2 at 60C for about one minute. Thereafter the current density could be increased to a limit set by cell agitation etc. During the striking operation, a minor amount of gassing occurred. It was not found possible to demonstrate a cathode efficiency significantly different from 100 per cent for deposits of 0.3 mil. Anode efficiency is also close to 100 per cent.

The plating solution was found to give a good direct nickel deposit on all alloys tested—commercially pure aluminum, 5052, 6061, 7075 and a number of special purpose experimental alloys. A potential industrial user also reports apparently favourable initial results on a casting alloy containing 13 per cent silicon.

PROCEDURE FOR GENERAL NICKEL PLATING

For general plating, or for building up deposits on aluminum after the strike had been applied, very rapid deposition was possible. The highest value consistent with sound plating on simple objects was found to be 750 amp/ft^2, and this appears to be a function of solution agitation, work piece conductivity and available voltage rather than an inherent limit of the solution. This current density approaches the order of the maximum rate of deposition reported for any nickel plating solution,[3] and is likely to allow practical electroforming. The bath was found to be stable in extended use.

Direct plating was found to be practical on zinc, mild steel, stainless steel and brass, following appropriate cleaning operations only and without requiring an activation step for stainless steel. Titanium would not accept a satisfactory direct plate. It is interesting to note that the strongly acid solution was compatible with both zinc and mild steel for direct plating. Plated articles of the various materials showed good resistance to atmospheric corrosion in the laboratory at a distance of 600 feet from Halifax Harbour after a twelve-month interval. Limited ad hoc testing of various nickel plated steel articles plated with one mil of nickel for shipboard use has also been performed. This indicates that this form of nickel plating has remarkable versatility.

ADHESION OF NICKEL PLATING PRODUCED

Only in the case of nickel plating on aluminum were quantitative adhesion studies made. Plating on the other metals cited appeared to be of good quality so far as could be ascertained by qualitative tests and by its corrosion behaviour. Typical samples for adhesion testing had nickel plates 0.3 mil thick.

The nickel plating on aluminum, in the as-plated condition consistently showed adhesion of at least 4000–5000 psi in shear on soldered lap joints. Because of the proximity of the test results to the ultimate properties of solder, studies were undertaken to devise a test of more extended range. The simplest form of improved test, based upon a method suggested by Schickner, Beach and Faust,[4] used a soft soldered lap joint tested while refrigerated in a dry ice-acetone mixture. The range of this test was up to over 10,000 psi in practice, the usual limit being not over 12,000 psi.

This improved test confirmed that the adhesion range of plated stock was at least 4000–5000 psi. It also enabled the effects of heat treating operations to be assessed. The most effective heat treatment cycle appeared to be a ten-minute soak at 500C followed by quenching. Metallographic examination of heat treated plated stock enabled the thin diffusion layer to be identified as Ni_2Al_3.[5] Adhesion of heat treated stock exceeded the capability of the test, showing about 10,000 psi minimum in shear typically. Qualitative tests based on bending do not disclose adhesion deficiencies in as-plated or heat treated samples.

CORROSION TESTS OF NICKEL PLATED ALUMINUM

Samples of nickel plating 1 mil thick on 2S aluminum alloy, and on alloys developed for corrosion resistance to high temperature water, were tested in pure water at 350C under static conditions and in water flowing at 20 ft/sec, the bulk of the testing being performed by Atomic Energy of Canada Limited, at Chalk River, Ontario. The plated aluminum showed significant improvement in corrosion resistance compared with that of unplated material. Porosity in the plating, or possibly pitting corrosion, seemed to be responsible for failure. In most, though not all cases, there was rapid lateral penetration at the nickel-aluminum interface once a pore reached there. Thus, although this form of plating had good characteristics, it could not be chosen over electroless plating on account of the freedom from porosity of the latter.

DISCUSSION OF RESULTS

The nickel plating process described here has shown considerable versatility on a laboratory scale for a wider range of applications than originally envisaged. It is unique as a method for plating on high silicon aluminum alloys. It is remarkable as a method for plating directly on aluminum alloys in that the initial strike and later high speed deposition can be made from the same solution without modification, as well as permitting direct plating on a variety of other materials, including mild steel and stainless steel. The chief limitation of the process seems to be the requirement for an unusually precise control of chloride concentration. Pilot plant evaluation is now under way by a licensee of the process to determine whether the laboratory scale promise can be duplicated in larger equipment.

ACKNOWLEDGMENTS

The work reported herein constitutes part of DRB Project No. D12-75-20-01, Electroplating, Anti-Corrosion and Battery Applications. The author wishes to acknowledge the assistance of Messrs. G. Vincent, J. Cromwell, S. P. Goudey, in performing parts of the experimental work involved. Permission of the Defence Research Board of Canada to publish this paper is also acknowledged.

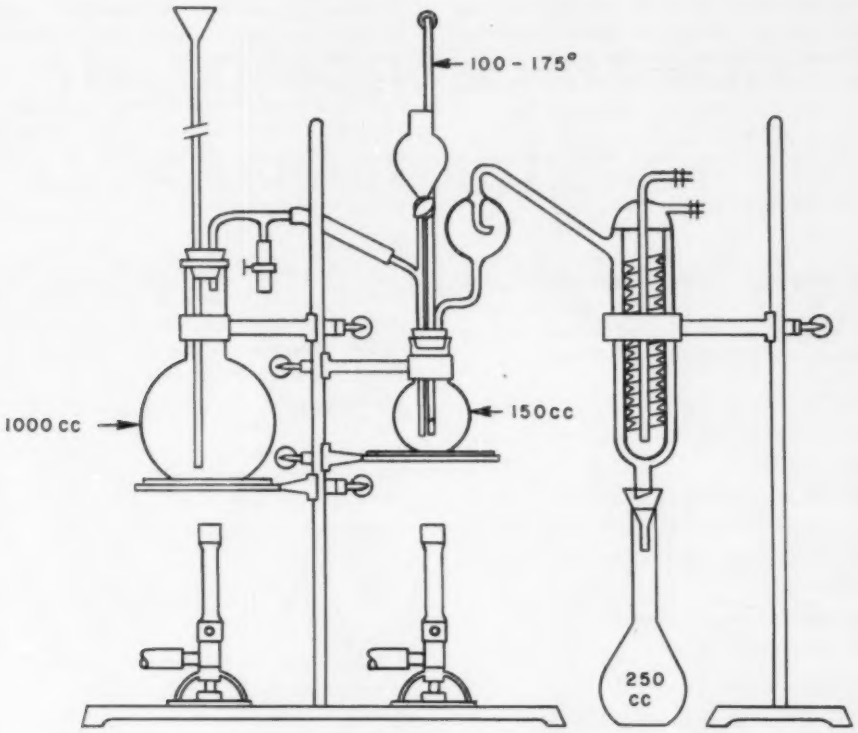

Fig. 1. Apparatus for fluoride distillation (Modified Willard and Winter method).

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Dr. James T. N. Atkinson was born in England and received his early education there. He was awarded a B Eng in chemical engineering in 1944 and an MSc in physical chemistry, both from McGill University, and a PhD in metallurgical engineering from the University of Toronto in 1947. Following five years on the staff of the University of Toronto as a lecturer, Dr. Atkinson joined the staff of Naval Research Establishment, Dartmouth, Nova Scotia, where he is now in charge of the Electroplating Group. He is a member of the American Electroplaters' Society, The Electrochemical Society, and of the Association of Professional Engineers of Nova Scotia.

APPENDIX

ANALYTICAL CONTROL

by D. G. GAGE†, A. SHLOSSBERG‡ and M. HEIT‡

Some modifications to existing analytical methods for nickel baths were required for routine control. For convenience, the analytical methods developed are given below. It should be noted that the chloride content is the most critical; the other components may be present in quite a wide concentration range. These methods cover bath components only; no methods are given for the determination of possible contaminants.

Separate samples of the bath are required for determination of nickel, boric acid, fluoborate and for chloride and sulfate.

1. *Nickel:*

Total nickel is determined by precipitation with dimethylglyoxime.

Procedure:

Dilute a 10 ml sample of the bath to 250 ml. Pipette a 10 ml aliquot of this into a 400 ml beaker, acidify with 5 ml

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concentrated HCl and dilute to approximately 250 ml. (If iron is present or suspected, 5 g citric acid may be added). Make alkaline with ammonia, heat to 80C, add with stirring 20 ml of a 1 per cent alcoholic solution of dimethylglyoxime. Digest over steam for 30 minutes, test for completeness of precipitation, filter on a tared medium porosity sintered glass crucible, wash with hot water, dry 1½ hours at 110C, cool and weigh.

Calculation:

Ni in g/l = wt of complex x 0.2031 x 2500.

2. *Fluoborate:*

A method for determination of fluoride described by Willard and Winter[1] may be used for fluoborate determination. Fluoride is steam distilled as hydrofluosilicic acid and an aliquot of the distillate titrated with thorium nitrate.

Reagents:

1. Standard-sodium fluoride (N/10)
2. Thorium nitrate (N/10)
3. Buffer solution (9.48 g. monchloroacetic acid, 2 g. NaOH in 100 ml water)
4. Aqueous indicator (0.05 per cent sodium alizarin sulfonate)
5. Sodium hydroxide solution (2 per cent)
6. Hydrochloric acid solution (N/10)
7. Sulfuric acid, concentrated
8. Alcoholic indicator: (a) Zirconium oxychloride 0.150 g/50 ml water
   (b) Alizarin red—dissolve 1 g sodium alizarin sulfonate in 100 ml ethanol, filter, add 150 ml ethanol to filtrate.

Mix 3 parts (a) with 2 parts (b) when required.

Apparatus: See Fig. 1.

Procedure:

Pipette a 2 ml sample of the standard nickel bath into the distillation flask, add 15 ml of distilled water and attach to stills. When a flow of steam is generated with the by-pass open, run in 20 ml of concentrated sulfuric acid and raise the temperature to 135C. Close the by-pass and raise the temperature to 180C. Collect almost 200 ml of distillate and test for completion of the distillation by adding a few drops of alcoholic indicator to an additional 10 ml sample. If it turns yellow, all the fluorine is not distilled, and distillation must be continued. Dilute the distillate to 250 ml and pipette a 50 ml aliquot into an Erlenmeyer flask. Add 50 ml of distilled water, 8 drops aqueous indicator and adjust the acidity with dilute sodium hydroxide and hydrochloric acid until the pink color from the addition of the former is just discharged. Add 1 ml of buffer solution and titrate to the first permanent pink with thorium nitrate solution. An extra two drops of indicator near the end point gives a more pronounced color change. Determine the blank.

Standardize the thorium nitrate against a 10 ml sample of sodium fluoride solution by diluting to 100 ml, adding 1 ml of buffer and titrating to the end point.

Calculation:

Fluoborate in g/liter = ml $Th(NO_3)_4$ x Normality x 54.26

3. *Boric Acid:*

Boric acid is determined according to Serfass, et al.[2] However, it is necessary to determine the blank titration of an otherwise standard nickel bath containing no boric acid.

4. *Chloride*

Since a relatively small amount of chloride is present in the bath its determination is more critical than that for the other components. Several methods were investigated and best results were obtained by using the classical Volhard titration after removal of the nickel.

Procedure:

A 100 ml sample of the plating bath is treated with approximately 10 ml of 15 per cent sodium hydroxide (until solution is alkaline) heated with some paper pulp to aid in coagulation, cooled, diluted to 1000 ml and the nickel hydroxide allowed to settle. To a 50 ml aliquot of the supernatant liquid is added 5 ml of 6 N nitric acid and a measured amount (excess) of standard silver nitrate. The silver chloride is coagulated by addition of 2–3 ml of nitrobenzene. One ml of the indicator (20 per cent ferric alum solution) is added and excess silver nitrate is back—titrated with standard potassium thiocyanate.

Calculation:

Net ml $AgNO_3$ x Normality x 7.093 = chloride in g/liter

5. *Sulfate:*

Sulfate may be determined on a separate aliquot of the same sample used for chloride above.

Reagents:

1. Hydrochloric acid—concentrated
2. Barium chromate—13 g + 40 ml conc. hydrochloric acid diluted to 500 ml with water.
3. Sodium Thiosulfate—N/10
4. Starch indicator solution

Procedure:

To a 5 ml aliquot of the supernatant solution prepared above for chloride analysis add 10 ml of the acid barium chromate solution, heat gently, make alkaline with ammonia to appearance of yellow barium chromate. Cool, filter, wash with warm water. To the filtrate add 10 ml concentrated hydrochloric acid and 0.2 to 0.3 g of potassium iodide. Titrate the liberated iodine with thiosulfate solution to a pale yellow colour, add 3 ml of the starch indicator and continue the titration to the disappearance of the blue color. Carry a blank through all steps.

Calculation:

ml $Na_2S_2O_3$ x Normality x 64.04 = g $SO^{=}_4$/liter.

ACKNOWLEDGMENTS

The work reported herein constitutes part of DRB Project No. D12-75-20-01, Electroplating, Anti-Corrosion and Battery Applications. Permission of the Defence Research Board of Canada to publish this paper is also acknowledged.

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THE CORROSION PROTECTIVE CHARACTERISTICS OF DECORATIVE CHROMIUM PLATE

by W. H. SAFRANEK, H. R. MILLER and C. L. FAUST*

This report was prepared for presentation to the zinc die cast finishing symposium sponsored by the American Zinc Institute on November 11 and 12, 1959, and covers one phase of the research conducted on die cast finishing at Battelle for the American Zinc Institute. From a study of chromium plate quality as related to plating conditions, ranges were established for depositing crackfree and nearly porefree chromium, which inhibited corrosion in the nickel plate on which the chromium was deposited. The crackfree and porefree chromium also inhibited basis-metal corrosion in copper- and nickel-plated zinc die castings.

INTRODUCTION

SOON AFTER INTEREST WAS REVIVED in high-temperature, high-ratio chromium plating baths in 1958,[1] a comprehensive program was undertaken at Battelle to establish ranges in conditions and appropriate controls for depositing improved chromium plate. This investigation, which constituted one phase of the research conducted on the American Zinc Institute zinc die cast finishing program, included a study of the effects of changing individual plating conditions over the following ranges:

Chromium plate thickness	0.004 to 0.35 mil
Chromic acid concentration	27 to 63 oz/gal
Sulfuric acid concentration	0.17 to 0.47 oz/gal
Chromic to sulfuric acid ratio	80:1 to 195:1
Trivalent chromium concentration	<0.1 to 15.4 g/l
Temperature	90 to 130 F
Current density	100 to 350 amp/sq ft

PROCEDURES FOR EVALUATING THE QUALITY OF CHROMIUM PLATE

During the course of this investigation, several hundred zinc die cast panels were polished, buffed and plated with 0.4 mil of copper and 0.8 mil of bright nickel. The copper and nickel plating procedures were carefully controlled to insure a uniform quality and thickness. For example, plastic edge shields were employed to keep the thickness of plate as uniform as possible over the entire panel area.

After chromium plating with a specified set of conditions, each panel was subjected to two tests, as follows:

(1) Electrographic printing
(2) Corrodkote[2], two or four complete cycles.

Electrographic printing consisted of saturating a 2 x 3 inch piece of emulsion-free, photographic paper with a solution of dimethylglyoxime in alcohol and water, pressing the paper on the surface of the plated panel and applying low-voltage direct current between the plated surface and a cathode. Any nickel exposed through pores, cracks, or other discontinuities in the chromium plate reacted with the reagent in the photographic paper and was precipitated on the paper as nickel dimethylglyoxime. The red precipitate was imprinted on the paper, providing a permanent record of all discontinuities in the chromium. The details on the procedure for electrographic printing are described in "Developments in Electrographic Printing," by H. R. Miller and E. B. Friedl, in this issue. Representative prints showing pores and cracks in chromium appear in Fig. 1.

Electrographic printing revealed cracks that could not be detected by examining the surface under a 500-power microscope. Cracks as narrow as 0.005 mil were clearly resolved as red lines, 1.5 mils in width. Thus, the magnifying effect of the printing procedure for cracks was of the order of 300X.

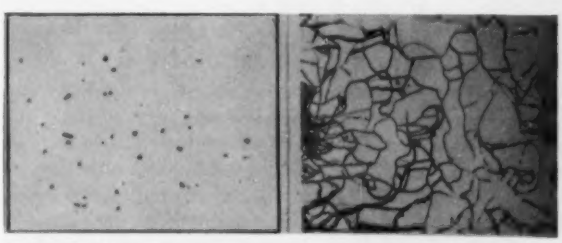

Fig. 1. Electrographic prints of porous and cracked chromium over bright nickel plate. The left print is representative of all chromium plates less than 0.02 mil in thickness. The right print is representative of all 0.025 mil-thick (or thicker) chromium plates deposited on low-temperature baths.

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TABLE I

CORRELATION BETWEEN ELECTROGRAPHIC PRINTING AND CORRODKOTE TESTING OF ZINC DIE-CAST PANELS PLATED WITH COPPER, BRIGHT NICKEL, AND 0.025 TO 0.035 MIL OF CHROMIUM[a]

Panel	Number of Pores Revealed by Electrographic Printing[b]	Number of Corrosion Defects Caused by Two Cycles of Corrodkote		Number of Corrosion Defects Correlated With Pore Sites	
		Blisters	Pits	Blisters[c]	Pits
61M	3	1	1	1	None
38G	1	1	None	1	None
40C	6	7[d]	1	4	1
50L	11	2	6	2	6
50N	7	1	5	1	5
52C	None	None	None	None	None
52E	4	1	1	1	1
52G	3	1	2	1	2
52H	1	None	1	None	1
52K	2	None	3	None	2
52L	None	None	None	None	None
52M	2	None	1	None	None
52N	3	None	10	None	3
56C	1	1	1	None	1
56D	3	5[e]	1	2	1
56E	3	5	None	1	None
56H	1	None	None	None	None
56I	None	None	1	None	None
56J	2	None	1	None	None
56L	1	None	None	None	None
96I	4	2	1	2	1
98G	2	None	None	None	None
98K	2	None	None	None	None
Total	62	27	36	16[c]	24

a. Data for 2 x 2½-inch areas on 3 x 3-inch zinc panels subjected to electrographic printing and Corrodkote. The thicknesses of the copper and bright nickel on each panel were about 0.4 and 0.8 mil, respectively. The chromium plates included deposits in 33-, 45-, 53-, and 63-oz baths at 100, 110, 120 and 130 F.
b. The pore count excluded a total of 9 red spots caused by micronodules in the nickel plate.
c. Five additional blisters on these panels coincided with macroscopic cracks visible after two 20-hour cycles of Corrodkote testing.
d. Two blisters coincided with cracks in the chromium plate.
e. Three blisters coincided with short cracks in the chromium plate.

Pores with a diameter as small as 0.05 mil were resolved by electrographic printing, but the magnification for pores was only about 50X. Although pores with a diameter appreciably less than 0.05 mil were not detected by electrographic printing, such very small pores appeared to be of only minor consequence, when electrographic printing data subsequently were correlated with accelerated corrosion data.

CORRELATION BETWEEN ELECTROGRAPHIC PRINTING AND CORRODKOTE DATA

For a group of 23 panels, chromium plated under different conditions and subjected to electrographic printing and Corrodkote testing, the sites of all corrosion blisters and pits were compared with the location of red spots on the electrographic prints, with the use of an indexing system to locate pore sites precisely. The correlation between the pore sites revealed by electrographic printing and the corrosion defects is detailed in Table I. Fifty-nine per cent of the blisters were traced to pore sites resolved by electrographic printing. Another 19 per cent coincided with cracks in the chromium plates. Thus, a total of 78 per cent of the blisters coincided with discontinuities in the chromium plates. Furthermore, 67 per cent of the corrosion pits correlated with pore sites in the chromium. These correlations support the hypothesis that corrosion in electroplated die castings begins only at discontinuities in the chromium.

Twenty-two per cent of the blisters and 33 per cent of the pits could not be directly correlated with discontinuities revealed by electrographic printing. These blisters and pits probably coincided with pores in the chromium that were too small for resolution by electrographic printing. They were less consequential in number, however, than the number of corrosion defects predicted by electrographic printing.

Among the red spots counted on the prints for the panels listed in Table I, 65 per cent correlated precisely with blisters or pits after Corrodkote testing. The remainder are believed to have been caused by foreign particles settling out on the surface of the panels or the photographic paper just prior to printing. Tiny black specks could be seen in the centers of 73 per cent of these red spots when the prints were examined under a microscope.

EFFECTS OF CHANGING PLATING CONDITIONS ON POROSITY AND CRACKING IN CHROMIUM PLATE

Changes in the plating conditions produced the general effects summarized in Table II. Changes in the thickness of the chromium were especially consequential. Chromium plate, 0.02 mil thick, or less, consistently contained a relatively large number of pores, whereas the pore count decreased markedly with a chromium-plate thickness of 0.025 mil, or more. With this increased thickness of chromium, however, cracking occurred consistently unless the temperature of the plating bath was increased to 120 or 130F.

Although increases in the chromic acid concentration progressively favored the deposition of crackfree chromium, the chromium deposited in a high chromic acid concentration of 53 or 63 oz/gal not only was milky but also was slightly porous, even at a thickness of 0.03 mil. Thus, the best chromic acid concentration for depositing crackfree chromium with a minimum of pores appeared to be 47 oz/gal.

An increase in the chromic to sulfuric acid ratio from 110:1 to 155:1 not only reduced the tendency for cracking, but also favored the deposition of porefree chromium plate. Furthermore, the 0.03-mil-thick chromium plates deposited in the higher ratio baths resisted cracking upon heating (to 320F), whereas this thickness of chromium deposited in low-ratio solutions did not.

The specific effects of changing the chromic acid concentration, the chromic-sulfuric acid ratio, and the temperature of the plating bath are charted schematically in Fig. 2.

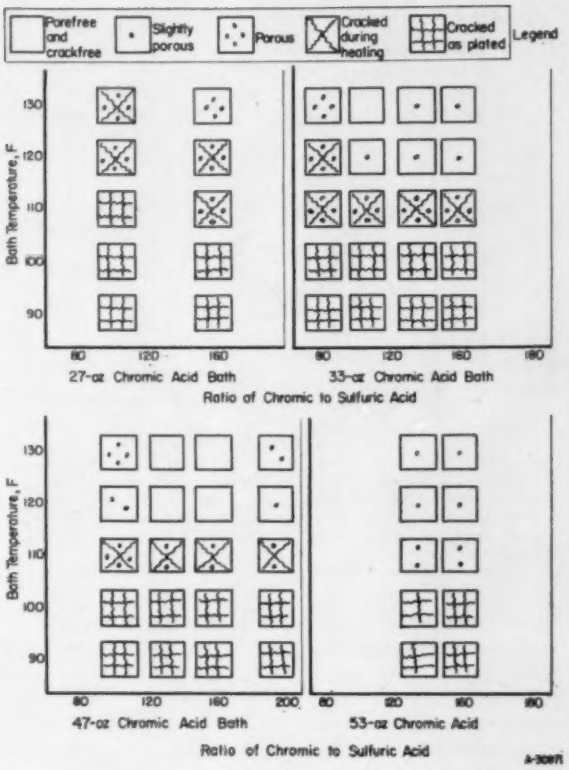

Fig. 2. Schematic chart showing the structure of 0.025 to 0.035-mil-thick chromium plates.

TABLE II

EFFECTS OF INCREASING THE CHROMIC ACID CONCENTRATION, ACID RATIO, TEMPERATURE, AND CURRENT DENSITY ON THE CHARACTERISTICS OF THE CHROMIUM BATHS AND CHROMIUM PLATES

Operating Condition Parameter Investigated	Range Investigated	Porosity of Chromium Plate	Tendency for Cracking	Brightness of Chromium	Plating Rate	Throwing Power[3]
Chromic acid concentration	27 to 63 oz/gal	Minimum observed with 45-oz bath	Progressively decreases with increasing concentration	Progressively decreases with increasing concentration	Progressively decreases with increasing concentration	Progressively decreases with increasing concentration
Chromic-sulfuric acid ratio	80:1 to 195:1	Minimum observed at 155:1	Progressively decreases with increasing ratio	Progressively decreases with increasing ratio	Progressively decreases with increasing ratio	Progressively increases with increasing ratio
Bath temperature	90 to 130 F	Minimum observed for 120 and 130 F with high ratio of 155:1	Progressively decreases with increasing temperature	Progressively decreases with increasing temperature	Progressively decreases with increasing temperature	Progressively decreases with increasing temperature
Current density	100 to 350 amp/sq ft	No effect observed	No effect observed	Minimum observed for each temperature	Progressively increases with increasing current density	Progressively increases with increasing current density
Thickness of chromium plate	0.01 to 0.3 mil	Progressively decreases with increasing thickness	Progressively increases with increasing thickness	Slightly decreases with increasing thickness	—	—

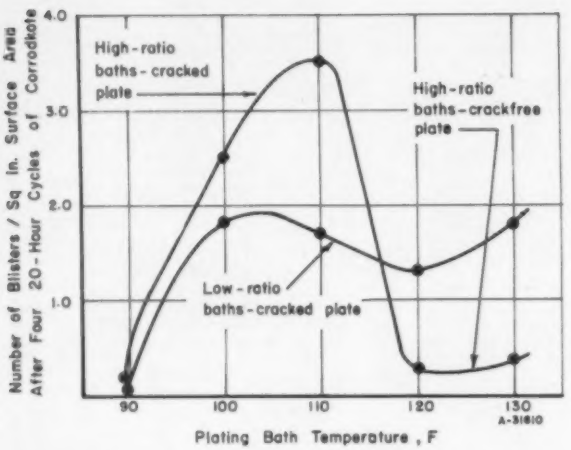

Fig. 3. Relationship between corrosion blisters on copper-, nickel-, and chromium-plated zinc die-cast panels and the chromium plating conditions. Thicknesses of the copper, nickel, and chromium plates were about 0.4, 0.8, and 0.03 mil, respectively.

Quantitative relationships for 0.03 mil-thick chromium are apparent from the Corrodkote data shown in Fig. 3. Although these quantitative data indicate an excellent corrosion performance for chromium deposited at 90F, such plate contained unsightly cracks. Furthermore, several experts consulted by the authors deem the bright plating range at 90F too narrow to be practical for complex-shaped die castings.

TRIVALENT CHROMIUM CONCENTRATION EFFECTS

Chromium that was plated at 300 amp/sq ft, 130F, in freshly prepared 47-oz, chromic acid baths containing less than 0.01 g/l of trivalent chromium, was relatively porous and nonprotective. Corrodkote caused an average of 1.6 blisters/sq in. after two cycles and 3.4 blisters/sq in. after four cycles, for panels plated with 0.03 mil of chromium in these baths. After building up the trivalent chromium concentration to 0.5 g/l by electrolytic dummying, relatively nonporous chromium was deposited. For panels plated with 0.03 mil of chromium in baths containing 0.5 g/l, or more, of trivalent chromium, Corrodkote caused only 0.2 and 0.55 blisters/sq in. after two and four cycles, respectively. Chromium plates deposited in baths containing 0.5, 0.7, 0.9, 1.0, 1.3, 1.6, 5.3, or 15.4 g/l of trivalent chromium were equivalent in quality, but the solutions containing 5.3 or 15.4 g/l of trivalent chromium exhibited less polarization than the baths containing a lower concentration.

Trivalent chromium is formed by cathodic reduction in chromic acid baths. Its equilibrium concentration depends upon the relative rates of formation and reoxidation at the anode. The rate of reoxidation is independent of sulfuric acid concentration, temperature, and the anode current density (above 100 amp/sq ft), but its rate of formation is influenced by several factors.[4] A concentration of about 1.0 g/l appeared to be the equilibrium concentration for solutions operated with a cathode current density of 300 amp/sq ft, an anode current density of between 100 and 200 amp/sq ft and a temperature of 130 F. It was necessary to electrolyze at a lower temperature with a lower cathode current density to build up a higher trivalent chromium concentration. Even so, electrolysis for a total of 14 hours/l of solution with a cathode current density of only 20 amp/sq ft at 80 F produced a trivalent chromium concentration of only 1.6 g/l. Methyl alcohol had to be added to one of the experimental solutions to reduce hexavalent chromium chemically in order to investigate a higher trivalent chromium concentration (5.3 and 15.4 g/l).

EFFECTS OF IMPURITIES

Nickel, which can be introduced into commercial chromium plating baths by drag in from the nickel plating bath, and copper and zinc, which can be introduced by dissolution from deep, blind holes, were investigated as impurities by adding the metal carbonates to 10-liter experimental baths. Electrographic printing and Corrodkote data indicated no harmful influence on the quality of the chromium plate as a result of adding zinc. Copper and nickel, however, induced porosity in the chromium plate, judging from the electrographic prints. The blister count after four cycles of Corrodkote for panels plated with chromium in baths containing copper or nickel confirmed the results of electrographic printing. The relationship between the blister count and the concentrations of the impurities is shown in Fig. 4.

LIMITING THICKNESS FOR CRACKFREE CHROMIUM

No pores were revealed by electrographic printing in the chromium plates deposited 0.05 to 0.3 mil thick in 33- or 45-oz, chromic acid baths containing a high ratio of chromic to sulfuric acid acid and operated at 120 or 130F. Almost no blistering occurred during two Corrodkote cycles on panels plated with copper, bright nickel, and 0.05 mil or more of

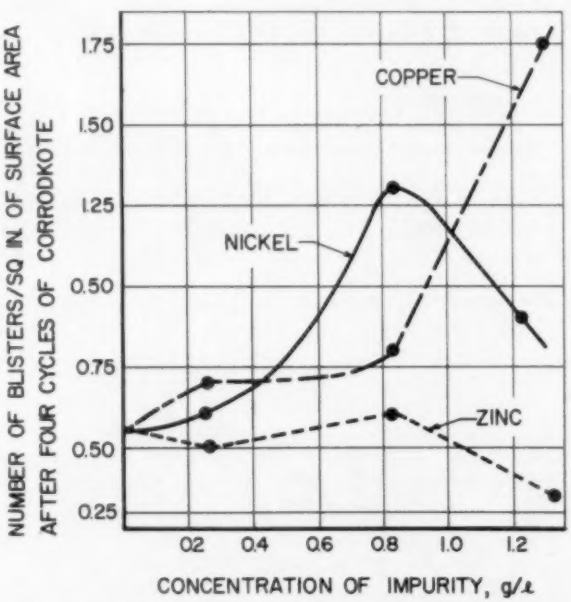

Fig. 4. Relationship between corrosion blisters on copper-, nickel-, and chromium-plated zinc die-cast panels and the concentrations of impurities in the chromium plating bath. The thicknesses of the copper, nickel, and chromium plates were 0.4, 0.8 and 0.03 mil, respectively.

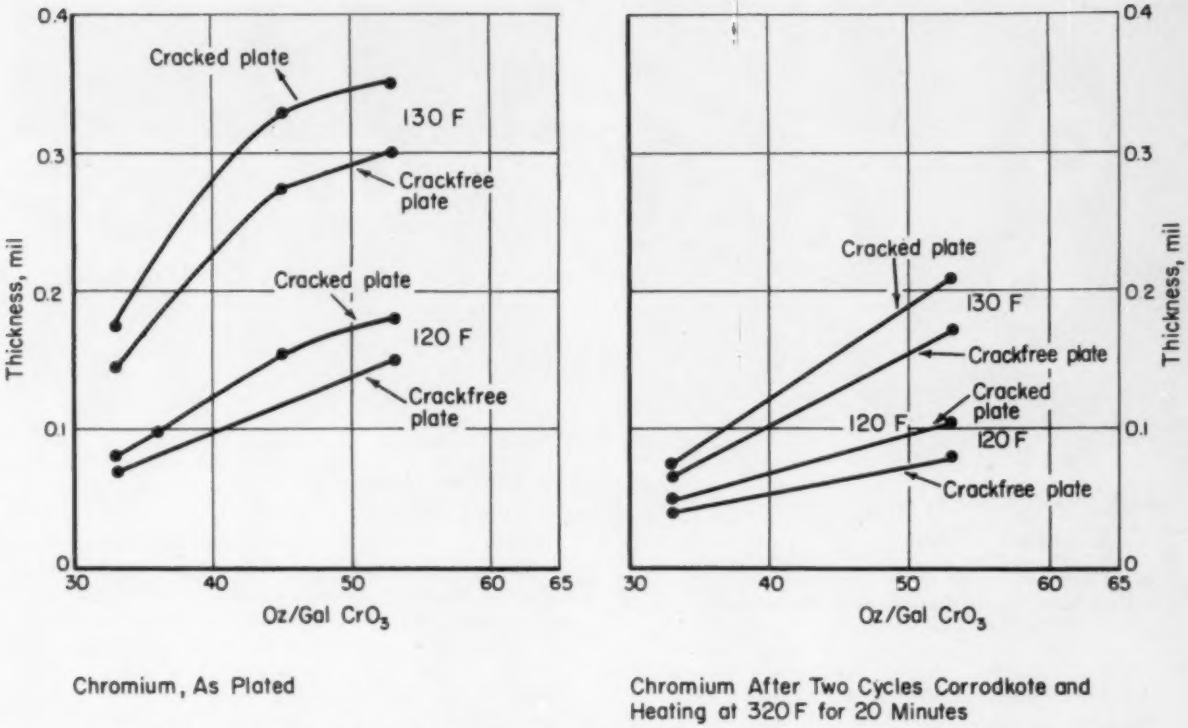

Fig. 5. Cracking in chromium plate deposited in high-ratio baths as a function of thickness, temperature, and chromic acid concentration, before and after heating.

chromium with these conditions. The density of blisters (not coinciding with cracks) was less than 0.03/sq in.

Cracking in these plates was influenced by the thickness of the plate, the chromic acid concentration, and the temperature of the plating bath, as shown in Fig. 5. Much thicker chromium plate was deposited in a crackfree condition at 130F than was deposited at 120F. Plate as thick as 0.28 mil deposited in a 45-oz, chromic acid was crackfree.

Not all the crackfree plates remained crackfree after Corrodkote testing and heating at 320F, as shown in Fig. 5. The heat treatment caused cracking in chromium as thick as 0.2 mil. However, the chromium deposited as thick as 0.13

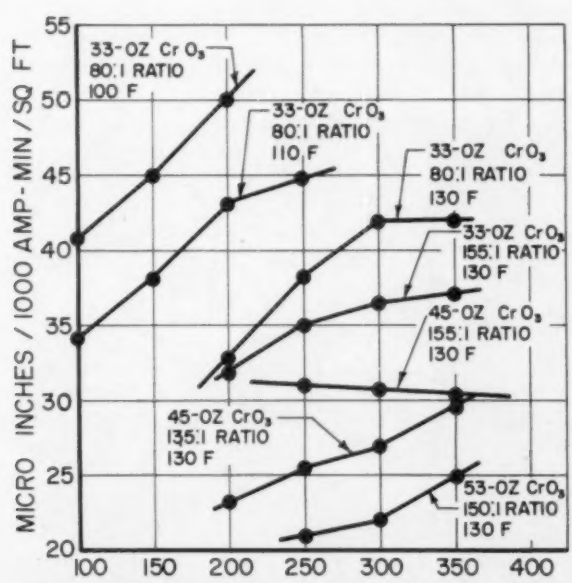
33-OZ $Cr O_3$ 80:1 RATIO 100 F
33-OZ CrO_3 80:1 RATIO 110 F
33-OZ CrO_3 80:1 RATIO 130 F
33-OZ CrO_3 155:1 RATIO 130 F
45-OZ CrO_3 155:1 RATIO 130 F
45-OZ CrO_3 135:1 RATIO 130 F
53-OZ CrO_3 150:1 RATIO 130 F
MICRO INCHES / 1000 AMP-MIN / SQ FT

Fig. 6. Chromium plating rates for different sets of chromium plating conditions.

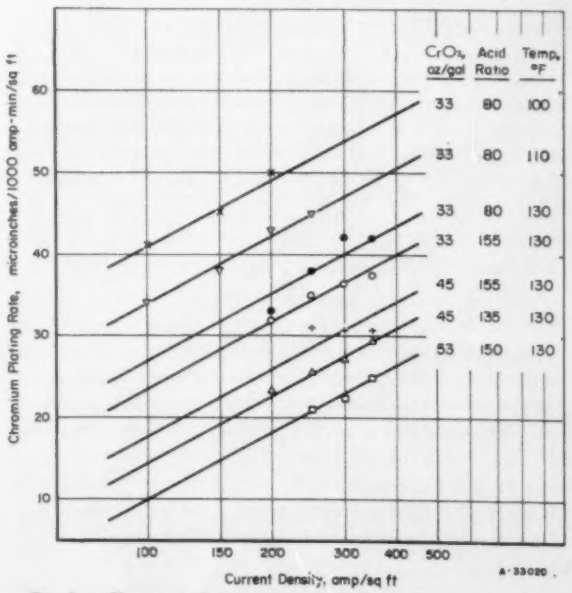

Fig. 6a. Chromium plating rates replotted from Fig. 6 on semilog paper.[6]

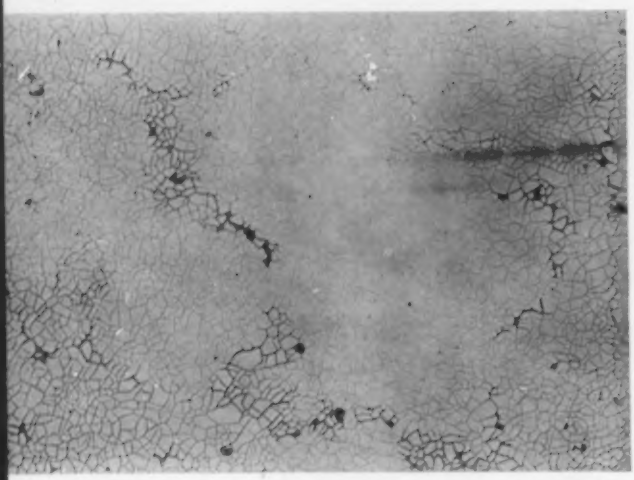

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Fig. 7. Surface view of die casting plated with copper, bright nickel, and dual chromium, after 48 hours of CASS testing. (Original Magnification 75X).

mil in the 45-oz, chromic acid bath at 130F remained free of cracks.

PLATING RATE AND THROWING POWER

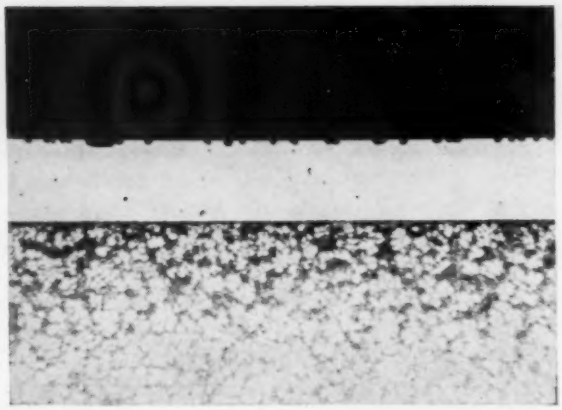
The effects of changes in chromic acid concentration, acid ratio, and other variables on the plating rate and throwing rate were noted in Table II. Plating rate and throwing power are reduced by increasing the chromic acid concentration or the temperature, but are increased by an increase in the current density. An increase in the chromic to sulfuric acid ratio favors throwing power, but generally causes a decrease in the plating rate. However, the plating rate in a 45-oz, chromic acid bath at 130F was higher for a solution with a 155:1 chromic to sulfuric acid ratio than it was for a bath having a 135:1 ratio. Fig. 6 shows the plating rates for selected sets of plating conditions. Figure 6a includes the same data on a semilog graph.[6]

The constancy of the plating rate in the 45-oz, 155:1-ratio, high-temperature chromic acid bath over a wide range in current densities is indicative of relatively good throwing power. The throwing power of the bath at 130F, as measured in a Hull Cell, was reported to be −15 per cent, compared with only −65 per cent for a 33-oz, 100:1-ratio chromic acid bath operated at 113F with a current density of 150 amp/sq ft.[3]

COVERING POWER AND ACTIVATION

Covering power—a measure of the ability of chromium baths to deposit chromium in deep recesses—generally is better in low-temperature solutions than it is in high-temperature baths. Two proprietary processes for depositing crack-free chromium* are reported to be better than high-temperature, high-ratio baths in this respect. Data on the other characteristics of the proprietary baths and the corresponding deposits are incomplete, however. Thus an item-for-item comparision with the characteristics of the high-temperature, high-ratio solutions and their deposits is not possible at this time.

* These processes are marketed by The Metal and Thermit Corporation and the General Development Corporation.



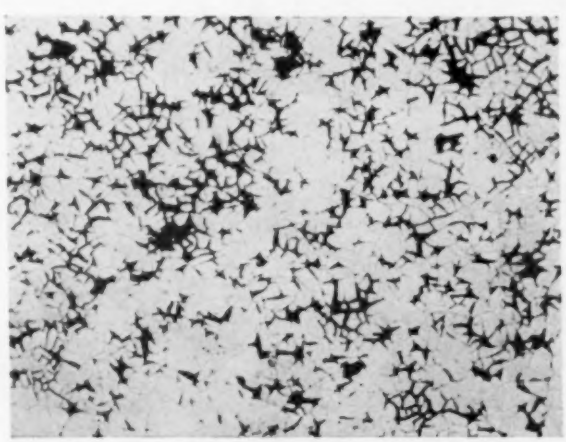
N58669

Fig. 8. Cross section of die casting plated with copper, bright nickel, and dual chromium, after 48 hours of CASS testing. (Original Magnification 250X).

Covering power is influenced by the procedure adopted for preventing nickel passivation. The authors have detected beneficial results for connecting nickel-plated die castings to a low-voltage current source before the work is immersed in either high- or low-temperature chromic acid solutions. This practice inhibits nickel passivation. As a result, covering power in recesses is improved. Low-voltage activation is more important in a high-temperature bath than it is in a low-temperature bath. A 2- to 4-volt cathodic treatment for 15 to 45 seconds has prevented rainbows in recesses.

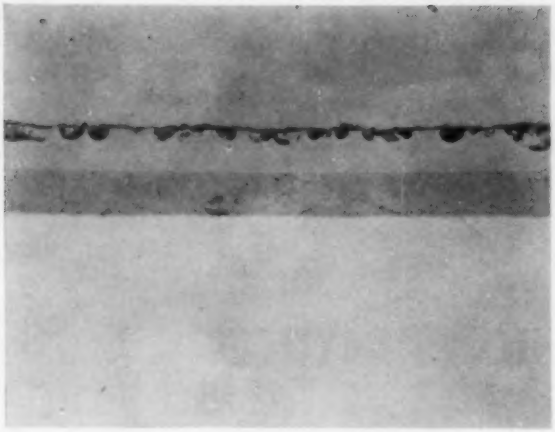
MICROCRACKED CHROMIUM

Electrographic printing and metallographic studies have indicated that microcracked chromium plate, such as that produced by dual chromium plating, is similar in corrosion-protective characteristics to duplex nickel plate. In each case, nickel is corroded under discontinuities in the chromium, but corrosion in depth is limited to the outer layer of the nickel for relatively long periods of exposure, by comparison with the performance of ordinary composites of bright nickel and conventional chromium. After 54 or 72 hours of CASS or 6 to 10 months outdoors, however, corrosion pitting in



N60359

Fig. 9. Surface view of die casting plated with copper, bright nickel (0.9 mil), and duplex chromium (0.04 mil) after 90 hours of CASS testing. (Original Magnification 100X).



N60345

Fig. 10. Cross section of die casting plated with copper, bright nickel (0.9 mil), and duplex chromium (0.04 mil) after 90 hours of CASS testing. (Original Magnification 500X).

duplex nickel-regular chromium composites has become unsightly on many of the specimens exposed during this research program. Corrosion "crazing" and microflaking also became unsightly when nickel- and duplex-chromium-plated die castings were subjected to 54 or 90 hours of CASS.

Photographic examples of pitting in duplex nickel were shown in a previous publication.[5] Figures 7 to 10 show the extent of corrosion in composites of nickel and dual chromium.

CONCLUSIONS

The research data described in this report are useful in explaining the improved level of performance reported previously for thicker chromium plate deposited in a crack-free form.[5] Porosity in chromium plate is markedly reduced when its thickness is increased to 0.025 mil; at a thickness level of 0.05 mil, or more, chromium deposited on smooth surfaces is essentially porefree.

The data have also indicated optimum conditions for depositing porefree and crackfree chromium, as follows:

Chromic acid concentration	45 to 47 oz/gal
Sulfuric acid concentration	0.29 to 0.30 oz/gal
Chromic to sulfuric acid ratio	150:1 to 160:1
Trivalent chromium concentration	At least 0.5 g/l
Temperature	130 ± 2F
Cathode current density	
Best for bright plate	300 to 350 amp/sq ft
Permissible range for crack-free and porefree plate	150 to 350 amp/sq ft

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[6]Private communication from Dr. Dodd S. Carr, Freeport Nickel Company.

William H. Safranek is assistant chief of the Electrochemical Engineering Division at Battelle Memorial Institute, Columbus, Ohio. As such, he is associated with various research projects aimed at developing finishes for protection against corrosion and finding new methods for producing metals. He has been at the research center since 1945.

Previously, Mr. Safranek had gained industrial experience, working in electroplating at the Alemite Die Casting Company and Apollo Metal Works. He received a Bachelor of Science Degree in chemistry from the University of Chicago.

The Battelle scientist has authored or coauthored some 25 technical articles and chapters in books. He is active in the work of The American Society for Testing Materials' Committee B-8 on electrodeposited metals. He served as chairman of the committee for the 1955 AES Tri-State Regional Meeting in Columbus, received the Carl Heussner Award in 1955, and the bronze medal award in 1956. He currently is serving as a member of the AES Editorial Board. Other technical groups with which Mr. Safranek is affiliated include The American Chemical Society, The American Society for Metals, and The Electrochemical Society. He is a past president of the Columbus Branch of the American Electroplaters' Society.

Hugh R. Miller's biography appears on page 527 of this issue.

Charles L. Faust was a graduate assistant at the University of Minnesota, receiving his PhD in chemical engineering in 1934. For a brief period, he was with the Southwestern Bell Telephone Company and Western Electric Company. He joined the staff of Battelle Memorial Institute as a research engineer in 1934, and at present is chief of the Electrochemical Engineering Division. Metal finishing, electroplating, electrowinning, electrorefining, and extractive electrometallurgy, electrolysis and batteries, electro processes, and waste disposal are the subjects of the Division's activities. Author or coauthor of over seventy technical articles, chapters in five books, and over forty patents.

Dr. Faust was a member of the board of directors of the Electrochemical Society from 1943 to 1945 and 1947 to 1951. He was a vice president from 1947 through 1949 and president in 1950.

He was an associate editor of the Monthly Review and PLATING, publications of the AES from 1942 until 1949; associate editor of Modern Electroplating, second edition, 1953; associate editor of Electroplating Engineering Handbook 1955. At the present time, he is section editor of Chemical Abstracts, Section 4, Electrochemistry.

During the war, he served on a subcommittee of the War Metallurgy Committee. Now is a consultant for the Materials Advisory Board of the National Academy of Science. He is a registered Professional Chemical Engineer of the State of Ohio.

He is a member of the ACS, the Electrochemical Society, the AES and the Institute of Metal Finishing.

DEVELOPMENTS IN ELECTROGRAPHIC PRINTING

by H. R. MILLER and E. B. FRIEDL*

ABSTRACT

The electrographic printing method for evaluating porosity and cracking in protective-coating systems on metals is described and discussed. Electrographic printing makes use of a small direct current to transfer ions from the basis metal through discontinuities in the coating to a chemically treated dye-transfer paper. A pressure device is used during passage of the current to hold the material firmly against the treated paper. Color changes locate precisely cracks and pores in the coating. Advancements in the process include: (1) an improved one-step technique, (2) the use of dilute solutions, and (3) low-pressure techniques for curved surfaces.

INTRODUCTION

THE DECORATIVE VALUE of plated exterior parts for automobiles and other products is only as good as the corrosion resistance offered by the protective coatings. The protection afforded by such coatings depends on the absence of porosity. Metallographic examination of plated parts exposed to corrosive environments shows that attack generally is initiated at cracks or pores in the plated surface. Methods for the detection of pores and cracks in coatings of all kinds have received much attention by research workers. Many methods for the detection of such defects have been developed. The ferroxyl test[1] is one example, but it often fails to indicate significant differences in porosity when one print is compared with another, because sharpness is lost as a result of lateral diffusion of the colored ions in the paper. A method for indicating cracking and porosity in chromium plate is a cathodic treatment at 0.2 volt in an acid copper sulfate plating bath.[2] The procedure appears limited, however, in its inherent ability to locate and sharply define cracks penetrating to the metal underneath. Among the disadvantages of this procedure are the lack of a permanent visual record and the poor magnification of discontinuities. It was, therefore, desirable to find a method that would not only detect cracks and pores, but also reveal relative size and permit rapid comparisons with visual records. A procedure that has shown promise in recent work at Battelle is known as electrographic printing.

Electrographic printing was originally adopted for studying a variety of other metallurgical and protective-coating problems. The technique was first used by Glazunov[3, 4] to locate flaws in metals. Later, Hermance[5] extended the field to identify coatings and evaluate coating continuity of electroplated hardware. Shaw and Moore[6] adapted the process to study porosity in organic films. Thon and Addison[1] made an extensive literature review and gave commentary on porosity of electrodeposited metals and methods of determining porosity, including electrographic printing. The process subsequently was used at Battelle Memorial Institute in a study of the corrosion characteristics of food-container closures and tin-plated articles. An improvement in the technique made possible rapid comparisons of the experimental results from chromium-plating baths using selected operating conditions.[7]

WHAT IS ELECTROGRAPHIC PRINTING?

In the electrographic technique, a piece of dye-transfer photographic paper soaked in a dilute electrolyte solution is pressed firmly against the surface to be examined. A potential of 1.5 to 6.5 volts direct current is applied for several seconds to a few minutes across a "sandwich" formed by the test part and a suitable metal cathode separated by blotter papers soaked in dilute electrolyte. A schematic diagram of the "sandwich" is shown in Fig. 1. The specimen is made anodic. At pores or cracks in the protective coating, cations from the underlying metal are formed under the influence of the applied potential. They enter the gelatinized surface of the dye-transfer paper where they react with appropriate chemicals to form colored precipitates or soluble complexes. Cracks are shown on the print as colored lines, while pores

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appear as colored dots, as shown in Fig. 2 in black and white. Mirror images of the crack patterns or pore sites are produced.

In the latest Battelle procedure, the chemical indicators are added directly to the electrolyte in which the dye-transfer paper is soaked. This represents an improvement over previous methods which required at least two steps as follows: (1) transfer of the basis-metal ions to the dye-transfer paper, and (2) development of the transferred ions into colored chemicals.

EVALUATION OF ORGANIC, PHOSPHATE, AND TIN COATINGS

When electrographic printing was first used at Battelle to determine the porosity of organic coatings on metal closures for food containers, a spring-loaded press, shown in Fig. 3, was utilized. The circuit diagram is shown in Fig. 4. Statistical lots of closures were electrographed and exposed to selected foods or dilute chemical solutions for specified periods. A typical coating defect is shown in Fig. 5. After exposure, the closures were compared with the electrographic prints. Good correlation was indicated between the pore sites exposed by contact with food products and those shown by electrographic printing.

Excellent results were also obtained during a study of experimental phosphate coatings applied to steel. Phosphate coatings sometimes exhibit holes or "holidays" where the coverage is inadequate. The degree of surface coverage obtained by different metal surface treatments was determined by electrographic printing.

In another research program, the porosity of various lots of unfused tin plate was used as an index to determine the coating thickness after first proving that porosity was dependent upon the coating thickness. Prints produced from production lots showed wide variation in porosity. A technique was developed whereby the thickness could be predicted by comparison of an electrographic print with a series of standards produced from plates of known thickness.

EVALUATION OF DISCONTINUITIES IN CHROMIUM PLATE

The most recent work at Battelle has been concerned with porosity and cracking in decorative chromium plate over copper- and nickel-plated zinc-base die castings.[7] Examination of the many prints made during this program showed that chromium deposits less than 0.02 mil thick were about equally porous and that plates over 0.025 mil thick had only a few pores.

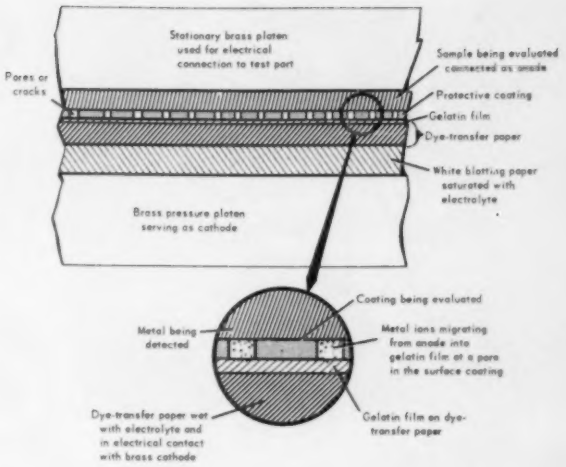
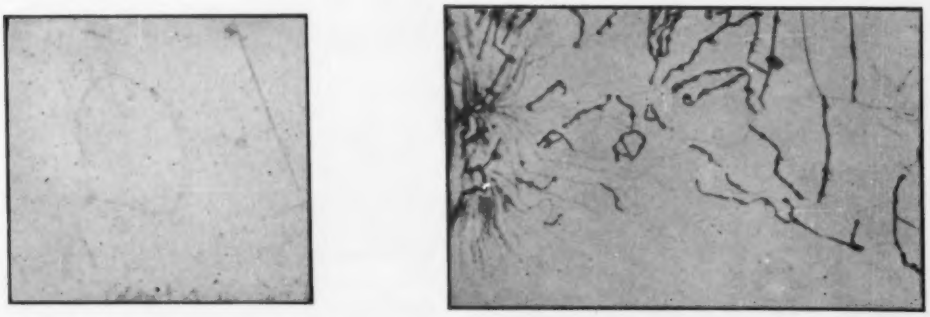

Stationary brass platen used for electrical connection to test part
Sample being evaluated connected as anode
Pores or cracks
Protective coating
Gelatin film
Dye-transfer paper
White blotting paper saturated with electrolyte
Brass pressure platen serving as cathode
Coating being evaluated
Metal being detected
Metal ions migrating from anode into gelatin film at a pore in the surface coating
Dye-transfer paper wet with electrolyte and in electrical contact with brass cathode
Gelatin film on dye-transfer paper

Fig. 1. Detail of electrographic printing method to illustrate principle of operation.

Although porosity differences in the relatively thin chromium plate were generally very small over wide ranges in operating conditions, electrographic printing showed that cracking in the thicker chromium deposits varied in degree. Differences observed in the number of cracks per unit area and type of crack pattern were attributed to specific changes in plating conditions. For instance, increasing the temperature of a conventional bath from 110 to 130F, the chromic acid concentration from 33 oz/gal to 45 oz/gal and the ratio of chromic acid to sulfuric acid from 100:1 to 150:1 increased the thickness at which a decorative crackfree chromium could be deposited from 0.02 to 0.3 mil.

The detection of changes in the crack structure of chro-



a. Porosity in fused tin plate on steel, ¼ pound per base box.

b. Cracking in 0.025-mil-thick chromium, plated at 90F in a 45 oz/gal bath with a chromic-to-sulfuric acid ratio of 135:1 on copper- and nickel-plated zinc die casting.

Fig. 2. Electrographic prints of porosity and cracking in protective coatings.

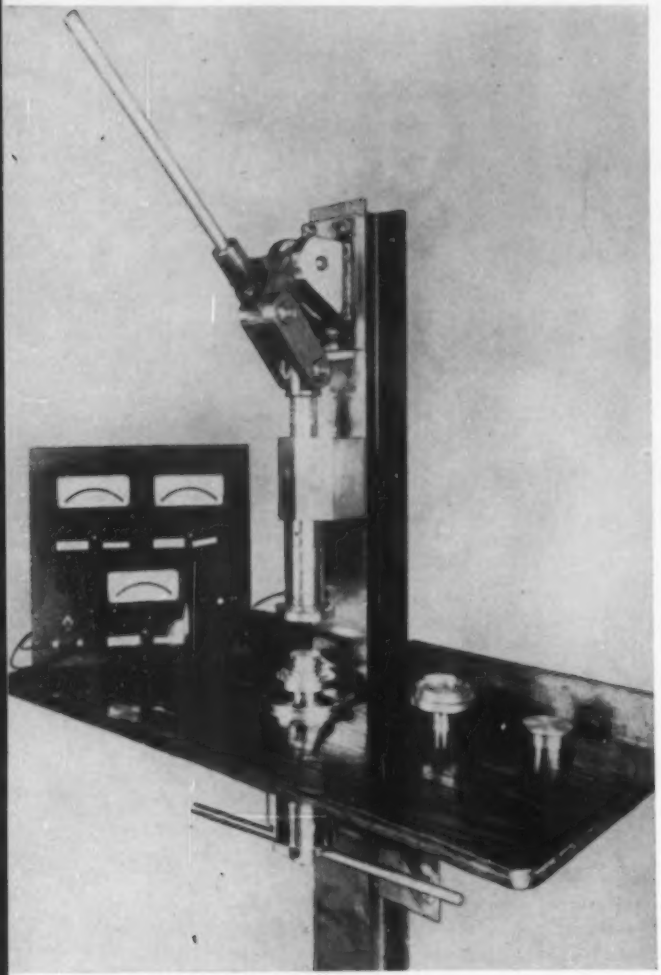


Fig. 3. Electrographic printing press and instrument panel. The closure is in the press ready to print. The platens for larger closures are on the table.

mium plate when chromium-plated articles were heated was expedited by electrographic printing. Figure 6 illustrates the changes that occurred when a composite of copper, nickel, and 0.06-mil-thick chromium on zinc die-cast alloy was heat cycled three times to 175F. The effect illustrated in these electrographic prints is believed to be associated with a specific addition agent.

PROCEDURE FOR PRODUCING ELECTROGRAPHIC PRINTS

The procedure for producing electrographic prints varies somewhat with the application. A list of equipment employed in electrographic printing at Battelle is shown in Table I.

By proper selection of a specific reagent which will react with the metal being detected and not the coating being evaluated, various combinations of electroplated or other

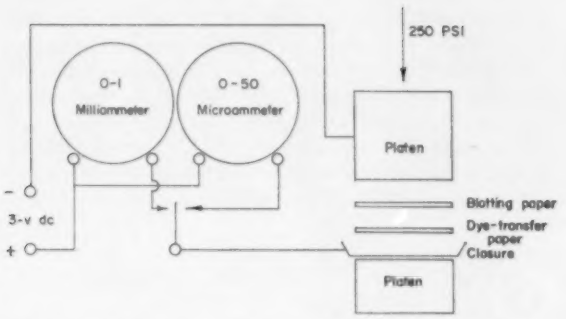


Fig. 4. Schematic circuit diagram for electrographic printing.

protective coatings can be studied. Table II lists the metals that have been detected and the coatings that have been evaluated by the authors.

Flat panels have been electrographed in a hydraulic press assembly as follows:

(1) Two blotter papers, cut to suitable size, were soaked in the combined electrolyte-indicator solution, then placed on the bottom platen (cathode).

(2) Dye-transfer paper, which was soaked before use for about 3 minutes in the indicator solution, was placed on the blotters, treated side up.

(3) A sheet of blotter paper soaked in the electrolyte-indicator solution was placed on the dye-transfer paper. An oversize piece of transparent plastic, to prevent wetting the metal (anode) platen, completed the "sandwich".

TABLE I

EQUIPMENT FOR PRODUCING ELECTROGRAPHIC PRINTS

Material/Equipment	Purpose
Sheet plastic	Protect anode platen from electrolyte
Plastic foil	Prevent molding clay from sticking to blotter papers
Aluminum foil	Cathode for low-pressure work
Dye-transfer paper[a]	Electrographic print
White blotter paper[b]	Pressure-equalizing pad and to absorb excess electrolyte
Cleansing tissue	Cleaning, drying, and protection of specimen from foreign matter
Filter aid	Cleaning
1.5 to 7.5-v d-c current source	Corrode basis metal under coating being evaluated
Milliammeter	Measure current
Microammeter	Measure current
Hydraulic press with flat platens	Pressure source

a Eastman Kodak Company, Type F, double weight.
b Absorbing grade, 200 pounds per 1000 square feet.

(3) A sheet of dry blotter paper or one soaked in the electrolyte-indicator solution was placed on the dye-transfer paper. An oversize piece of transparent plastic, to prevent wetting the metal (anode) platen, completed the "sandwich".

(4) The press was closed to squeeze out the surplus electrolyte, then opened and the top blotter and transparent plastic removed.

(5) A clean panel (anode) was placed in the press with the surface to be evaluated against the treated surface of the dye-transfer paper. The transfer paper and panel were removed briefly to roll the paper smooth with plasticine insuring good contact of the paper to the surface.

(6) The press was closed to produce a pressure of about 500 psi on the panel.

(7) A voltage of 1.5 to 6.5 volts was applied between the electrodes for 15 seconds to 2.25 minutes, depending on the coating being evaluated and the intensity of color desired in the print.

(8) The press was opened and the materials removed.

This procedure serves very well for laboratory studies. However, for field work, a low-pressure technique was developed for complex-shaped parts.

Complex-shaped parts were electrographed as follows:

(1) The part to be evaluated was clamped to a table top or other rigid surface. Molding clay was formed into a 0.25 to 0.5-inch-thick mold that would approximately duplicate the contour and cover the area to be treated. Aluminum foil was then wrapped around the mold, pressed against the plated surface, and removed.

(2) The area to be tested was wiped with solvent and cleaned with a water slurry of filter aid to remove oil and dirt particles.

(3) Dye-transfer paper was soaked for about 3 minutes in a solution containing the proper reagent for the metal being detected.

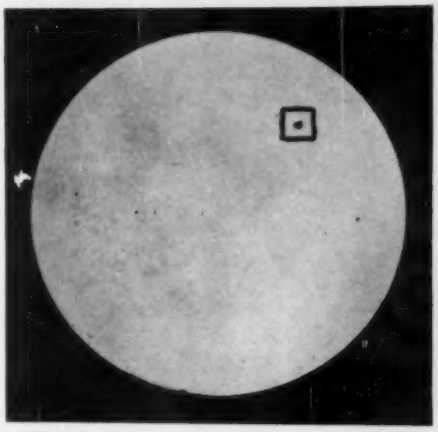
(4) Two pieces of blotting paper were saturated with a solution containing the proper electrolyte and metal indicator.

(5) One piece of white blotting paper was dipped for a few seconds in the indicator solution, as described in Step (3).

(6) The dye-transfer paper was placed (glossy side up) between the single sheet of blotting paper as the top layer and the two sheets of blotting paper as the bottom layer of the "sandwich". The "sandwich" was then rolled with a plastic-foil-wrapped molding-clay roll on a clean, flat, absorbent surface to remove the excess liquid.

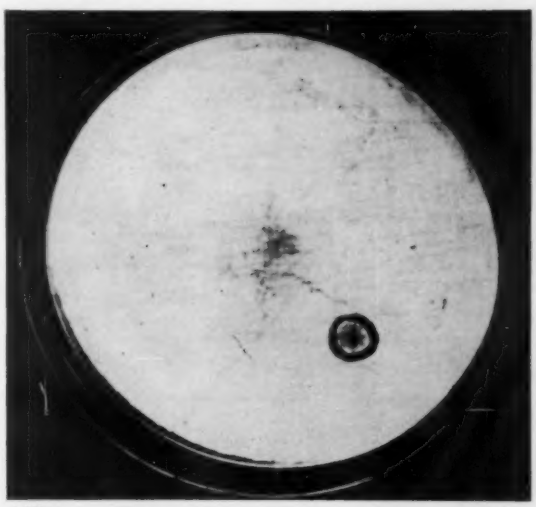
(7) The top blotting paper was removed and the remaining part of the "sandwich" was placed on the cleaned area of the part to be evaluated with the dye-transfer paper facing the area being evaluated. After rolling the "sandwich" with a plastic-foil-wrapped molding-clay roll (to insure good contact of the paper to the coating being evaluated), the aluminum-wrapped molding-clay mold was placed on the blotting paper and made the cathode.

(8) A 4.5-volt potential was applied making the part the anode for 30 seconds to 2.25 minutes. At the same time, hand pressure was continuously applied to the mold, in order to force the solution from the dye-



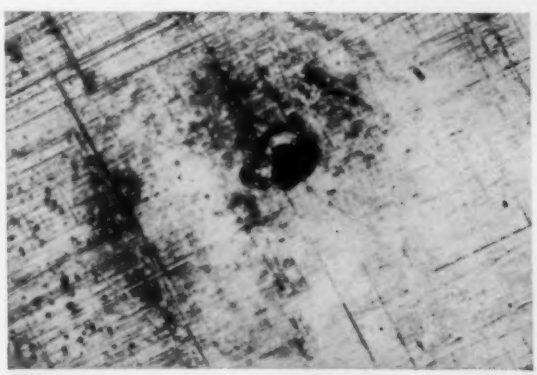
1.5X N55888

a. Photograph of a Ferricyanide Electrographic Print of a Food-Container Closure taken before exposure to applesauce.
The marked area correlates with the pit marked in photograph below. The porosity print is a mirror of the surface studied.



1.5X N55889

b. Photograph of interior of the same closure after 28 days' exposure to applesauce.
The organic has been removed. The deepest pit is located by the encircled area.



20X N57587

c. Photograph showing detail of the marked area in the above photograph. The pit depth is one-third the thickness of the basis metal.

Fig. 5. Electrographic print and photographs of the inside surface of a food-container closure.

TABLE II

COLOR REACTIONS PRODUCED BY METAL IONS AND SELECTED INDICATORS

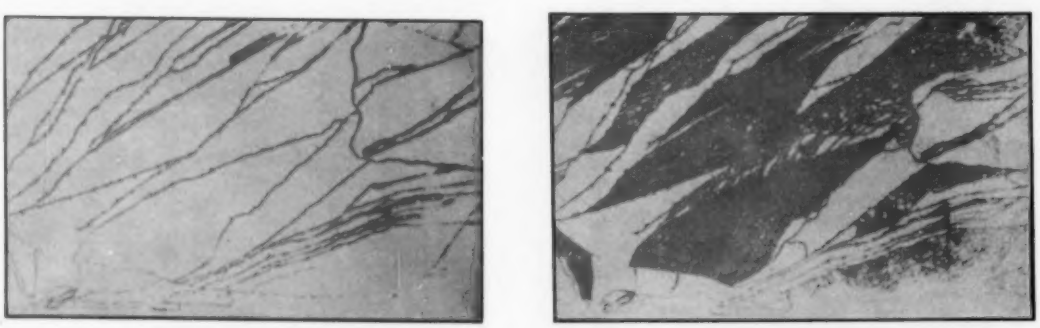
Metal Detected	Coating Being Evaluated	Reagent[a]	Color Reaction
Aluminum	Chromium	1 part saturated alcohol solution of Morin and 1 part distilled water; acidify with 2 or 3 drops of acetic acid in 250 ml of solution	Green under black light
Chromium	Nickel	1 part saturated alcohol solution of S-diphenyl-carbazide and 1 part distilled water	Violet
Cobalt	Chromium	1 part of a 1 per cent by weight dimethylglyoxime in 100 per cent ethyl alcohol and 1 part distilled water	Light brown
Copper	Nickel or chromium	1 part of a 1 per cent by weight α-benzoinoxime in 100 per cent ethyl alcohol and 1 part distilled water; make ammoniacal with 2 or 3 drops ammonium hydroxide in 250 ml of solution	Green
Copper	Chromium	See cobalt	Green
Iron	Tin, organic, phosphate coatings	0.5 per cent potassium ferricyanide in distilled water; acidify with 2 or 3 drops of concentrated hydrochloric acid in 250 ml of solution	Blue
Nickel	Chromium	Same as cobalt	Blood red
Nickel-cobalt alloy	Chromium	Same as cobalt	Red
Tin	Organic	Saturated water solution of cacotheline; make acidic with 2 or 3 drops of hydrochloric acid in 250 ml of solution	Violet

[a] The concentration of organic indicators does not appear to be critical and may be varied to suit the application. The acid or base concentration and potassium ferricyanide should be kept low.

transfer paper into the pores and cracks. The pressure at all points on the mold was made uniform as possible. The current through a 6-sq in. area usually ranged between 15 and 30 milliamperes.

(9) The dye-transfer paper was removed, allowed to dry in air and inspected for colored spots corresponding to pores in the coating and for colored lines corresponding to cracks.

Figure 7 illustrates the results obtainable when electrographic printing contour shapes. This zinc die casting was plated experimentally with copper, nickel, and conventional chromium. The print detected cracking at the high-current-



a. Before heat cycling. b. After heat cycling.

Fig. 6. Prints of 0.06-mil-thick decorative chromium on a nickel- and copper-plated zinc-base die casting illustrating the effect of heat cycling three times to 175F.

density areas and a large amount of porosity in the recessed area.

DISCUSSION

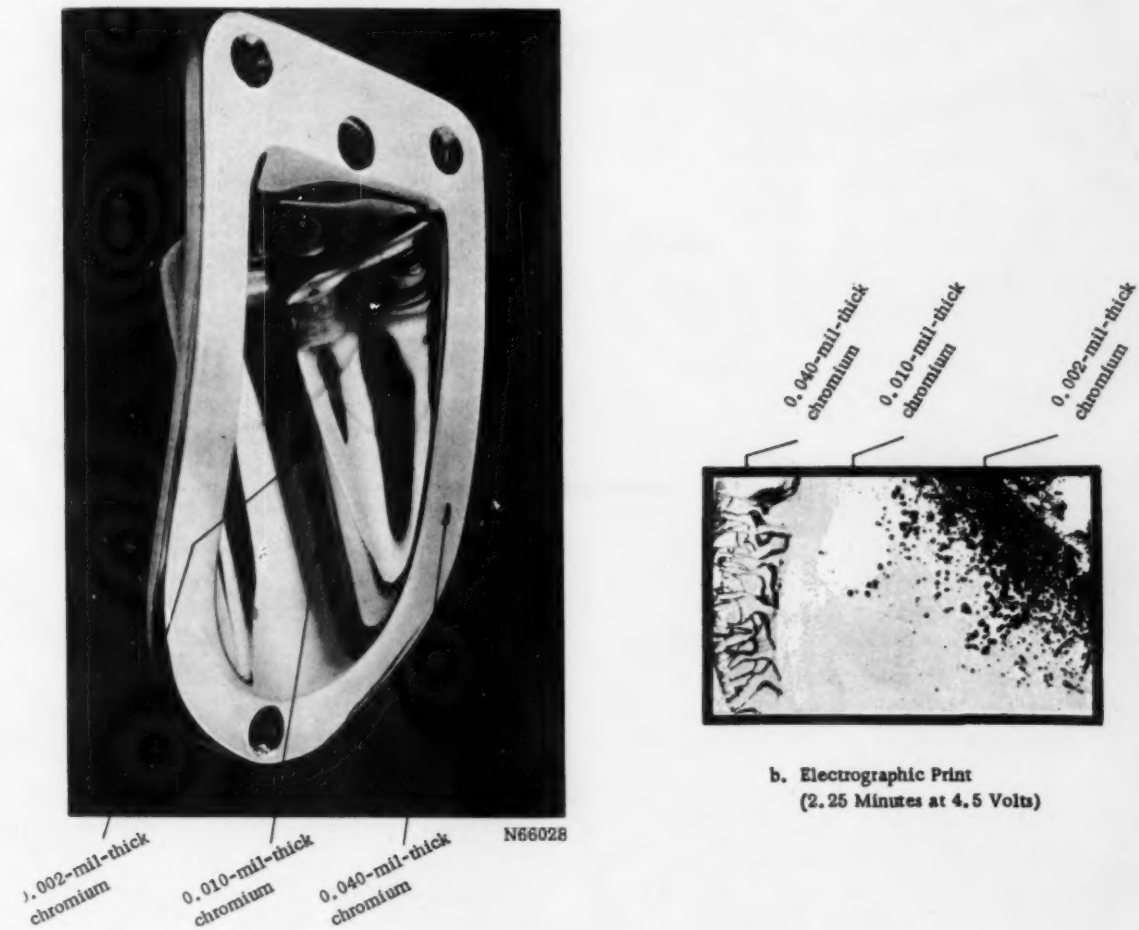
Many organic indicators give distinctive color reactions with more than one metal. Such an indicator is dimethylglyoxime, which gives an intense blood-red reaction with nickel, but reacts with cobalt to produce a light brown, soluble complex compound. A 50 per cent nickel-50 per cent cobalt alloy reacts with this indicator to give a light-red product. Dimethylglyoxime also will react with copper, forming a green product that is also absorbed by the dye-transfer paper. A complete evaluation of the reagents mentioned in Table II would probably show that a number of them also react to form colored compounds with other metals.

Colored spots have been detected on prints which were not associated with discontinuities. Such spots either were brown, which was traced to lint particles, or light red with black dots in the center which could be traced to dust specks. Such spurious indications were eliminated by proper cleaning and by covering specimens with tissue paper prior to printing.

Smears sometimes resulted from not pressing out enough of the electrolyte at unprotected sheared edges. White, starlike spots were sometimes produced by air trapped between the sample and the gelatinized surface of the dye-transfer paper. Misalignment of the pressure platens can cause low-pressure areas.

During the investigations with unfused tin plate at Battelle, it was found that concentrated solutions such as 5 per cent KNO_3, as employed by other researchers, attacked tin coatings. This observation led to the development of techniques using very dilute solutions, and eventually to the direct, one-step system. For example, when the solution was changed to one or two drops of hydrochloric acid in 250 ml of distilled water, it became practical to make as many as 10 to 15 successive prints at low voltages before minor differences in the print began to appear.

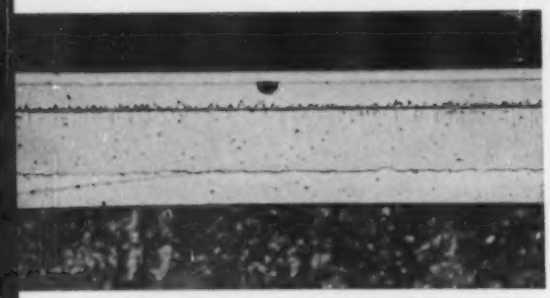
It was observed that a constant pressure was important to control the current flow. For example, with the hydraulic press assembly at a constant pressure of 500 psi and a voltage of 6.5 volts across the "sandwich", the current density for a nickel-chromium sample initially was about 10 milliamperes/



a. Experimentally Plated Zinc Die Casting

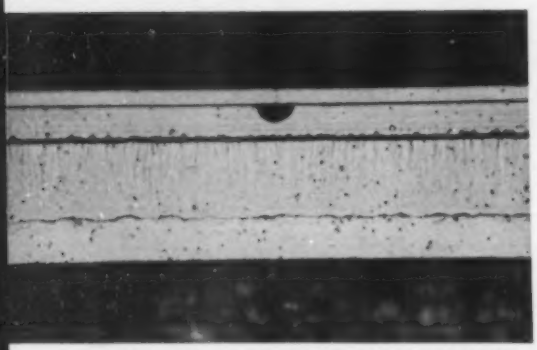
b. Electrographic Print (2.25 Minutes at 4.5 Volts)

Fig. 7. Electrographic print (right) of a complex-shaped zinc die casting (left) plated experimentally with copper, nickel, and conventional chromium.



500X Etchant: 35 Acetic Acid, 15 Nitric Acid N64746

a. Cross section of a representative crack after two electrographic prints (4.5 minutes printing time).
The depth of the nickel cavity is 0.18 mil and the width is 0.31 mil.



500X Etchant: 35 Acetic Acid, 15 Nitric Acid N64376

b. Cross section of a representative crack after four electrographic prints (9 minutes' printing time).
The depth of the nickel cavity is 0.28 mil and the width is 0.55 mil.

Fig. 8. Photomicrographs of metal removal under narrow cracks in thick chromium deposits as a result of electrographic printing at 6.5 volts.

sq in., falling to 4 ma/sq in. in a straight line over a 2.25-minute period. This drop appears largely due to polarization. Upon repeating the experiment at 30 psi, the initial current density was 4 ma/sq in. and a proportional degree of polarization occurred with time. Although there appears to be no difference between the detection ability of the printing technique employed at 500 psi and at lower pressures, the higher pressure is favored because of sharper definition of discontinuities and less chance of smearing.

The amount of electrolyte remaining in the blotter pads and transfer paper after the preliminary application of pressure was also important for control of current. For instance, when a wet top blotter pad was employed in the preliminary application of pressure, the current density during the subsequent printing step was 10 ma/sq in. When a dry top blotter was employed, it absorbed much of the excess electrolyte that was not squeezed from the sandwich and the current density at the same pressure and voltage was only 5 ma/sq in.

Because the first electrographic print of 0.005 to 0.02-mil chromium over nickel does not always reveal all of the pores in the chromium plate, a second print for such a thickness of chromium is sometimes desirable. The number of pores detected by the second print usually equals the number of corrosion pits showing up in an accelerated corrosion test such as copper-accelerated salt spray or Corrodkote.

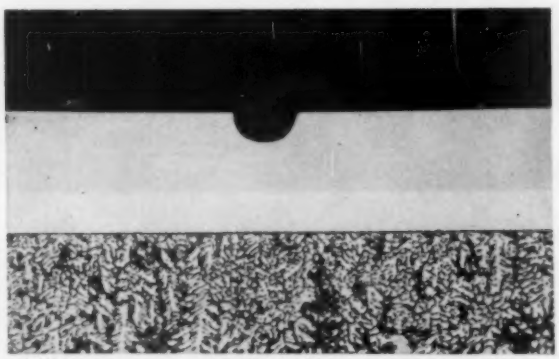
BASIS-METAL CORROSION

No attack of the surface coating occurs during electrographic printing if the proper chemicals are selected, if dilute solutions are adopted, and if the proper current and pressure conditions are applied. Electrochemical corrosion of the basis metal occurs, however, when the electrolyte penetrates through discontinuities in the coating. Figure 8a is a cross section of a representative crack illustrating the amount of nickel corroded while making two successive 2.25-minute prints of a crack in a 0.2-mil-chromium coating. Figure 8b shows the nickel corroded under a similar crack during a 9-minute printing period. The extent of nickel corrosion under a three-branched crack is shown in Fig. 9.

Dissolution of the chromium plate occurred only in an abnormal situation that existed when excess electrolyte was pressed from the blotter pads onto an area of the chromium not in the "sandwich". In one instance, 0.01-mil-thick chromium in a 0.2-sq in. area was completely dissolved when 6.5 volts was applied for 2.25 minutes. This dissolution was

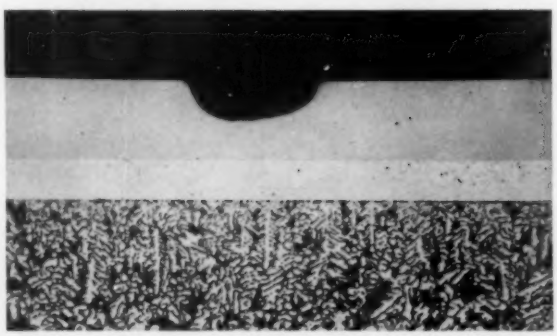
100X N65376

a. Surface view.



500X Picral etch N65501

b. Cross section of one branch of the crack, 0.85 mil wide at the surface and 0.35 mil deep.



500X Picral etch N65502

c. Cross section of the center of the crack, 1.7 mils wide at the surface and 0.5 mil deep.

Fig. 9. Photomicrographs showing corrosion under a branched crack in 0.01-mil-chromium deposit over bright nickel as a result of electrographic printing at 6.5 volts for a total printing time of 4.5 minutes.

eliminated when most of the electrolyte was pressed from the blotter pads and transfer paper by a preliminary application of pressure. A dry blotter pad on the transfer paper during the preliminary application of pressure was also helpful, but was not essential.

PORE MAGNIFICATION AND CRACK MAGNIFICATION

The magnification of pores in chromium-over-nickel electroplate that is achieved by electrographic printing depends on the thickness of the chromium plate, the size of the pores, the applied voltage during electrographic printing, and the printing time. The effect of increasing the printing time is illustrated below for two representative pores:

Diameter of Pore, mils	
After 2.25 Minutes of Printing	After 4.5 Minutes of Printing
1.6	2.0
1.2	1.9

The increase in pore diameter was a result of undercutting and subsequent flaking of the thin chromium plate, which progressed in proportion to the printing time. By extrapolating the above data to zero printing time, the initial pore diameters and magnifying power of the 2.25 minute printing period were calculated with the following results:

Initial Pore Diameter, mils (by Extrapolation)	Diameter of Red Spots on Electrographic Prints, mils (After 2.25 Minutes of Printing)	Pore Magnification Power of Electrographic Printing for 2.25 Minutes
1.2	33.5	28
0.4	24	60

The smallest pore detected in chromium over nickel plate by electrographic printing was about 0.05 mil in diameter. Yet, cracks as narrow as 0.005 mil have been detected in chromium over nickel.[7] The magnifying effect for narrow cracks was about 300.

SUMMARY

The work at Battelle has made the electrographic printing technique more useful and more practical. For instance (1) it can be employed as a one-step process, (2) dilute solutions are permissible, (3) many aspects of the technique and results are better understood, (4) a high degree of magnification and reproducibility is achieved, (5) printing of contour shapes in a one-step operation is possible, and (6) electrographic printing is adaptable to field work. In research, the technique has the advantage of saving time and effort, thus permitting more extensive programs to be devised. In quality control as well as in research, its ability to produce a permanent visual record of discontinuities in the final coating, allows investigators to have a "picture" reference that eliminates much of the human error in evaluation of coating discontinuities.

ACKNOWLEDGMENT

The authors wish to acknowledge the assistance of Mr. W. E. Berry and Mr. W. H. Safranek for their helpful suggestions and assistance in the preparation of this manuscript. Mr. Berry also performed the work with food-container closures. We wish, also, to express thanks to Mr. Richard Buchheit and Mr. Charles Brady for the metallographic work. The permission of Battelle Memorial Institute and the American Zinc Institute to publish the information in this paper is appreciated.

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Hugh R. Miller is a graduate chemist in the Electrochemical Engineering Division at Battelle Memorial Institute. He has worked on metal finishing and plating problems since he joined the Battelle staff in 1953, shortly before receiving a BS degree in chemistry at Ohio State University. In 1954 and 1955, he took a leave of absence for a tour of duty with the Army Chemical Corp.

Since the American Zinc Institute started its project at Battelle, Mr. Miller has given his efforts to the problems of finishing die castings. In this connection, he was responsible for the preparation of the electroplated panels for the corrosion study and contributed to the development of the leveling zinc plating process published in 1958. He is a Columbus Branch member of the AES.

Burt Friedl is a principal chemist in the Corrosion Research Division at Battelle Memorial Institute, Columbus, Ohio. He is associated with various research projects aimed at developing new corrosion resistant materials of construction. Recent studies have included research in paint, coatings, chemical polishing, exhaust fumes, and alloy development.

Mr. Friedl has been with Battelle since 1944. Previously, he was associated with the Daystrom Corporation where he gained experience in electroplating and laminated plastics. He is a member of the National Association of Corrosion Engineers.

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SEMI-ANNUAL MEETING

ASTM, COMMITTEE B-8

HOTEL SHERMAN, CHICAGO, ILLINOIS
FEBRUARY 3-5, 1960

by Edward B. Saubestre
Enthone, Inc., New Haven, Conn.

Committee B-8
C. H. Sample, Chairman

It was decided to ballot on changes in voting rules in ASTM B-8 Subcommittees, and to broaden the scope of B-8's title to include anodizing, electroless plating, plating on non-conductors, etc. AES Project 15 had suggested that the CASS and Corrodkote tests be made ASTM standards. These two tests were referred to Committee B-3 for their consideration. A previous ballot on meeting in California after the AES Convention rejected the plan overwhelmingly. Accordingly, the next meeting will be in Philadelphia in the earlier part of October. A proposed recommended practice for plating nickel on nickel was approved 94–3, and will be published later in the year. A donation of $500.00 to the AES research fund was made by ASTM through B-8.

Sub-committee I—Specifications
F. Ogburn, Chairman

A section headed by H. Kafarski recommended that A 166-58T and B 201–55T be continued as tentatives, and this was approved. W. Safranek's section on definitions announced that a few negative votes had been received during balloting on proposed Definitions in Electroplating. These have been largely resolved, and the proposal will be re-balloted. W. Moline's section on electroless nickel announced that a book has been published by ASTM covering the section's work during the past few years. This book offers a very comprehensive review of the field. R. Saltonstall's section on bright nickel is concentrating on duplex nickel. A proposed specification on multilayered nickel (chromium overlay) on steel is to be submitted for balloting in the near future. This specification will also recommend a new method of ASTM designations for thickness. W. Geissman's section is reviewing A-219, and other ASTM specifications, to determine if thickness requirements for electrodeposited coatings should be revised upward. A task group headed by D. Bigge is looking into the English method of marking plated coatings for consumer use. A group headed by R. Ehrhardt will write up specifications on gold and rhodium plating. A task group headed by A. DuRose will investigate the need for a specification covering lead for engineering applications.

Sub-committee II—Performance Tests
W. L. Pinner, Chairman

B. Knapp submitted the final report on the Program IV corrosion tests (see Dec. 1959 issue of Plating for details), which will be voted on this summer. Program V will involve four thicknesses of three types of chromium plating over duplex nickel on steel. Program VI, not yet set up, will study zinc die castings. F. Lowenheim's section on solderability of tin alloy coatings ran into difficulty, in that the soldering tests being employed showed no apparent deterioration in solderability of various coatings after one year of storage. Further work is planned on the testing procedures. D. George's section is setting up a line to plate duplex nickel on aluminum, with and without copper undercoats. This will be followed by corrosion testing. W. Safranek and F. Lowenheim will prepare some papers on ASTM Corrosion Rating Systems, for use at a future symposium on this subject. The next corrosion test panel inspections will be made at Kure Beach, May 9–10, and Detroit, May 12.

Sub-committee III—Conformance Tests
A. Squitero, Chairman

The section on thickness testing, A. DuRose and R. Harr, Co-chairmen, submitted its final report at the last meeting for balloting. There were several negative votes, which will require clarification prior to re-balloting. The principal conclusions were quoted previously (Plating, op. cit.). A. Mendizza reported that his section on testing Cu—Ni—Cr coatings on steel by various methods of accelerated corrosion testing, ran into difficulty. Panels prepared by F. Romanoff did not fail in the Corrodkote test. Several hundred new panels will be prepared, using thinner coatings. The section on adhesion has nearly completed its bibliographic survey, but no work has started on specimen preparation.

Sub-committee IV—Electroplating Practice
E. B. Saubestre, Chairman

B. Knapp's section on plating nickel on nickel has completed its work (see B-8, above), and will remain on an inactive basis for two years, at which time, the ASTM specification will be brought up-to-date. H. Kafarski's section on industrial water requirements has written a report, which will be submitted this summer to several experts outside of ASTM for critical review. B. Cohen's section on plating chromium on chromium plans to modify the heat treatment requirements of B-177–55, and will report on this at the next meeting. W. Safranek headed a task group which drew up a list of suggestions for future work by Sub—IV. Eight suggestions were made for proposed recommended practices. Two fell outside of the scope of Sub—IV, while two others were rejected by the membership. The four remaining proposals are: auxiliary anodes, plating on sintered compacts, plating on high-nickel alloys, electroforming.

Sub-committee V—Supplementary Treatments
G. Best, Chairman

A report was made for L. Gilbert's section on chromate treatments on cadmium electrodeposits. At Rock Island, Ill., there was no further change in appearance from 2 to 3 years of outdoor exposure. Galvanic tests, using buttons of various metals, showed the degree of attack to increase in the order stainless steel, Almag, brass, and copper. In the New York exposure site, all 0.5 mil panels failed after one year and, curiously, none of the several types of chromate treatments gave improved results over untreated cadmium. The button test results were about the same as at Rock Island. At Kure Beach, however, the results in order of increasing corrosion, were brass, Almag, stainless steel, and copper. S. Spring's group on phosphating plans to study the effect of variations in the steel surface which influence phosphate coatings. Both ASTM Committee D-1 and General Motors will be asked to supply existing data on this subject. The testing program previously carried out by this section was dropped because of poor interlaboratory correlation of various testing procedures. C. Ostrander reported that his section is getting started on a program to test chromate treatments on aluminum and magnesium. A task group will be appointed to look into the salt spray requirements of B 201, in view of disagreement over which salt spray test should be used on chromate coatings.

Sub-committee VI—Anodic Oxidation of Al and Mg
R. Hafer, Chairman

R. Paulson reported that his section had completed a proposed specification for measuring oxide coating thicknesses on Al by eddy current techniques. This will be submitted for letter balloting. G. Kissin is setting up a task group to survey the need for a general specification on anodizing practice. It was suggested at the meeting that some of the items which should be considered include architectural and automotive finishes, dielectric applications, high temperature requirements, and hard coating. Initially, only sulfuric acid anodizing will be considered. Specification B 1 36–45, relating to sealing of anodized coatings on Al, requires use of a particular dye. Results obtained in various laboratories during the past several years have indicated that the test is not satisfactorily reproducible. While many variations may enter into the problem, a task group headed by J. Kerr found that variations in the standard anthraquinone dye are mainly responsible. He suggested that a standard lot of dye be prepared, and held in some location, such as the Bureau of Standards, for universal use. This would not be a major problem, since its annual use for this purpose in the U.S. is only about one pound.

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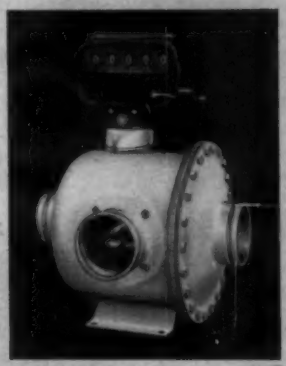

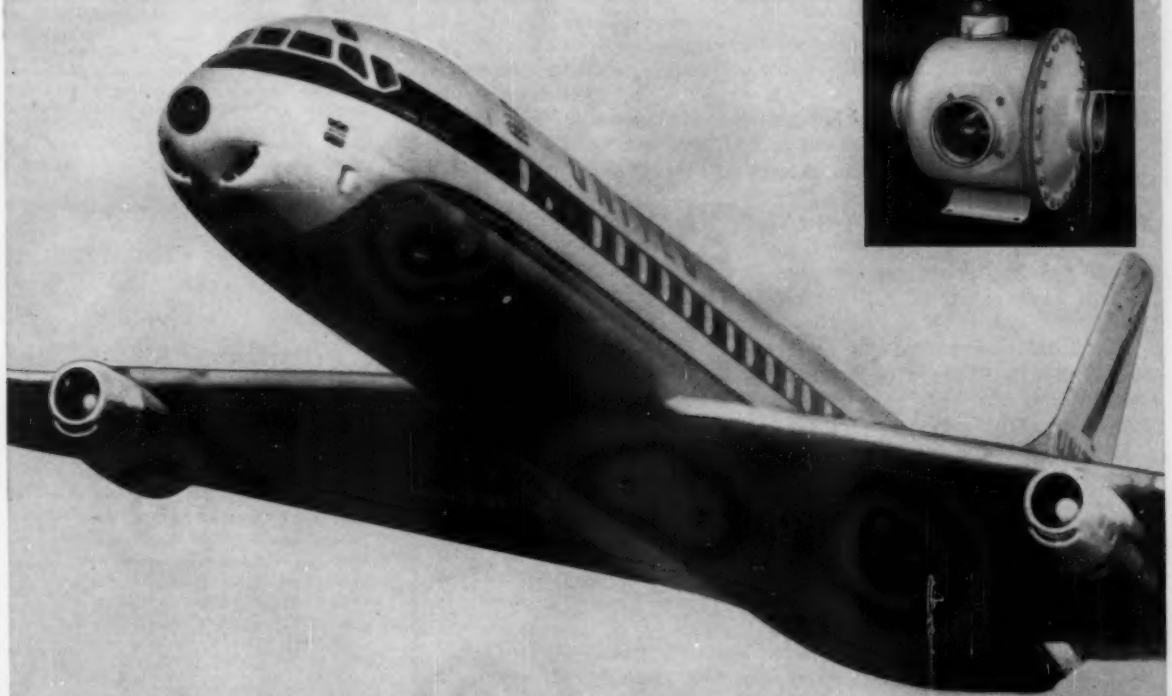

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AES RESEARCH PROJECTS: FROM BIRTH TO DATE

PROGRAM'S PHASE NO. 1. (1929-1944)

The Spotting of Plated or Finished Metals—National Bureau of Standards—(Concluded 1929)

Throwing Power in Chromium Plating—National Bureau of Standards—(Concluded 1929)

The Porosity of Electroplated Chromium Coatings—National Bureau of Standards—(Concluded 1931)

Protective Value of Nickel and Chromium Plating on Steel—National Bureau of Standards—(Concluded 1934)

Accelerated Tests of Nickel and Chromium Plating on Steel—National Bureau of Standards—(Concluded 1934)

Corrosion-Protective Value of Electrodeposited Zinc and Cadmium Coatings on Steel—National Bureau of Standards—(Concluded 1935)

Outdoor Exposure Tests of Electroplated Nickel and Chromium Coatings on Steel and Nonferrous Metals—National Bureau of Standards—(Concluded 1940)

Methods of Polishing Steel and Their Effects Upon the Protective Value of Electroplated Coatings—(Concluded 1944)

PROGRAM'S PHASE NO. 2. (1944-1959)

Project No. 1. "Stripping of Copper from Various Base Metals," Indiana University (1945–1947) Last phase conducted at National Bureau of Standards

Project No. 2. "Determination of Impurities and Major Constituents in Electroplating Solutions and Analysis of Cyanides in Plating Room Wastes," Lehigh University and Princeton University (1944–1955)

Project No. 3. "Adhesion of Electrodeposits," University of Michigan (1945–1947)

Project No. 4. "The Effect of Surface Finishing of Nonferrous Base Metals on the Protective Value of Plated Coatings," U. S. Time Corporation (1947–1954)

Project No. 5. "The Effect of Impurities and Purification of Nickel Plating Solutions," Michigan State University (1945–1957)

Project No. 6. "Porosity of Electrodeposited Metals," Princeton University (1946–1954)

Project No. 7. "Methods of Testing Thickness of Electrodeposits," Pennsylvania State University (1945–1951)

Project No. 8. "Polarization and Overvoltage," Cleveland Graphite Bronze Co., Division of Clevite Corp. (1946–1952)

Project No. 9. "Physical Properties of Electrodeposited Metals—Nickel," National Bureau of Standards (1947–1952)

Project No. 10. "Disposal of Plating Room Wastes," Yale University (1955–1957)

Project No. 11. "Current and Metal Distribution in Electrodeposition," Evansville College (1948–1952)

Project No. 12. "Cleaning and Preparation of Metals for Electroplating," Columbia University—Current (1948–To Date)

Project No. 13. "The Nature, Cause and Effect of the Porosity in Electrodeposits," National Bureau of Standards—Current (1950–To Date)

Project No. 14. "The Influence of Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating," Ontario Research Foundation—Current (1951–To Date)

Project No. 15. "Accelerated Corrosion Tests"—Current (1952–To Date)

Project No. 16. "Mechanism of Electrodeposition," University of Pennsylvania—Current (1955–To Date)

Project No. 17. "Microthrowing Power," Virginia Institute for Scientific Research—Current (1955–To Date)

Project No. 18. "The Mechanical Finishing of Metal Surfaces," National Lock Company—Current (1955–To Date)

(Only those Research Project Serial Reports listed on page 767 are available, all others are out of print.)

Frank Virgil

MEET MR. BRANCH PRESIDENT

THE Los Angeles Branch's newly elected and installed President, Frank Virgil, is a native Californian who, for fourteen years, has been associated with the L. H. Butcher Company of Los Angeles, subsidiary of The Udylite Corporation. He is a Sales Engineer in the field of metal finishing supplies and equipment.

Educated in California, Branch President Virgil served for over four years in the Air Force during World War II, much of it as a Glider Pilot.

He brings to the helm of the Los Angeles Branch during this period when his Branch will be hosting AES's 47th Annual Convention, a rich record of AES service, including successful tenure as Sergeant-at-Arms, Secretary, Librarian, Second Vice President, then First Vice President of the Society's pioneer West Coast Branch.

RESEARCH COMMITTEE CHAIRMAN

(To Date)

1923–1924	William Delage
1924–1925	R. L. Shepard
1925–1926	Frank J. Hanlon
1926–1929	R. J. O'Connor
1929–1933	Jacob Hay
1933–1936	William M. Phillips
1936–1938	George B. Hogaboom
1938–1941	Austin B. Wilson
1941–1943	Erwin Sohn
1944–1946	Carl E. Heussner
1946–1947	Ellsworth T. Candee
1947–1948	Dr. Richard M. Wick
1948–1949	Dr. Louis Weisberg
1949–1950	William M. Tucker
1950–1951	Dr. W. Andrew Wesley
1951–1952	G. M. Cole (Died Aug. '51) Dr. Donald Price
1952–1953	Dr. Donald Price
1953–1954	Dr. Earl J. Serfass
1954–1955	Dr. Earl J. Serfass
1955–1956	Leslie C. Borchert
1956–1957	Arthur H. DuRose
1957–1958	Robert A. Ehrhardt
1958–1959	Dr. Russel E. Harr
1959–1960	James D. Thomas

AES NEWS

1960 SPEAKERS LIST SOON TO ISSUE TO BRANCHES

Just completed by the Subcommittee of the Educational Committee responsible for its annual preparation, the AES's 1960 SPEAKERS LIST is now being processed at National Headquarters and will soon be reproduced for dissemination among Branch Librarians—and, to be doubly sure of Branch receipt and use, copies will also be issued to Branch Secretaries.

A voluminous edition created practically single-handedly for AES by Rafael Diaz of the Pittsburgh Branch, indefatigable chairman of that Subcommittee, the 1960 List not only identifies numerous qualified speakers on various electroplating, metal finishing and allied arts subjects of likely interest to AES's chartered Branches but also embodies abstracts of the respective titles for easier identification and appraisal by Branch Librarians. The List basically stems from a splendid progenitor AES list fashioned several years ago by I. William Marcovitch, secretary of the Philadelphia Branch.

THE PRECIOUS METAL PLATING AWARD
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PRECIOUS METAL AWARD'S NEW CERTIFICATE

The Precious Metal Plating Award of American Electroplaters' Society now being sponsored by the International Nickel Company is presented annually to that paper on that subject published during the fiscal year in PLATING MAGAZINE or TECHNICAL PROCEEDINGS adjudged best by the Society's Paper Award Committee. It commands a $50 cash award plus a certificate. The new certificate is shown above. When presented it is given in laminated form.

This year's Paper Award Committee is headed by William M. Tucker of the Eastman Kodak Company; and includes Dr. Henry Brown of the Udylite Corporation and Clarence H. Sample of International Nickel Company.

EXECUTIVE BOARD IN RESULTFUL APRIL MEETING AT NATIONAL HEADQUARTERS

Meeting first as a Budget Committee pursuant to the Bylaws of the Society, then attacking a formidable agenda of AES policy business as the Executive Board, that Board subdued the large quantity of business before it at a meeting, including a long evening session, held at National Headquarters, April 8. The National President presided.

Finalizing and approving an operating budget for the fiscal year July 1, 1960–June 30, 1961 aggregating very nearly the same amount as the operating budget prevailing for the current fiscal year (July 1, 1959–June 30, 1960) despite the assaults of generally risen and rising costs upon every individual's and every enterprise's pocketbook, the 1960–1961 budget becomes effective July 1, subject to ratification by the Supreme Society at its coming Annual Meeting.

As the Executive Board, it then made most of the 1960–1961 Committee appointments possible at this time, the balance to be accomplished prior to its next regular meeting (Los Angeles, July 24). These appointments mainly cover three-year terms effective July 25, 1960, and will be announced at the First Business Session of the Annual Meeting of the Supreme Society at the Los Angeles Convention.

The Board heard and acted upon reports of respective National Officers. It ratified the Temporary Charter of the new Memphis-Midsouth Branch, effective February 23, 1960, upon which it had unanimously favorably acted previously by Board letter ballot. It established standards by which to guide it in awarding its Award of Merit.

It was notified that the report of the Society's "AES Scientific Achievement Award Selection Committee" naming the third winner of that highest annual scientific honor of the Society had been received by the President. The winner will be announced at the Grand Opening Session of the 47th Annual Convention. He will deliver the "Third Annual William Blum Lecture" at the opening educational session of the 48th Annual Convention in Boston in June 1961, and will there be awarded his $500 honorarium and his scroll.

Among other action taken, it reviewed the AES membership census as at April 1, 1959 and ruled that the end-date for the determination of Branch winners in the Society's Branch Membership Expansion Competition be May 31, 1960 for the 1959–1960 fiscal year.

The Board also approved the Agendas of the Business Meetings of the Supreme Society to be held at the Los Angeles Convention, and these will be published in PLATING MAGAZINE's next issue.

Immediately following the meeting, several National Officers journeyed to Baltimore and enjoyed the splendid Baltimore-Washington Branch Annual Meeting at which the National President received the traditional "pot" of the "Order of Past Presidents."

CLOSER LINKING OF AES's EASTERN AND WESTERN BRANCHES LOOMS AHEAD

AES's devoted and generally thriving Far Western Branches will have their day in the Sun with the holding of AES's 47th Annual Convention in Los Angeles, July 24–28, first west of the Mississippi. With constantly improving air transportation shortening the distance between America's West Coast and East Coast, in fact—and with the recent creation of the Denver and Phoenix Branches heralding AES further western expansion—the Society is anticipating a day of even closer Far Western Branch participation and leadership in AES's plans and programs.

Meanwhile, inasmuch as so many of the members of West Coast Branches have been unable conveniently to come to AES family assemblies held east of the Mississippi, National Officers, by personal visit, have regularly brought the Society to Far Western Branches. Then-Presidents Clyde Kelly, Samuel Heiman and Francis T. Eddy respectively made Far Western Branch tours in 1956, 1957 and 1958.

Enroute to Los Angeles on Convention business, National Executive Secretary John P. Nichols will visit each of them this early May. On successive evenings from May 3–6, he will address the British Columbia Branch in Vancouver; the Seattle-Puget Sound Branch in Seattle; the Portland Branch and the San Francisco Branch—then the Los Angeles Branch before flying home.

NATIONAL PRESIDENT RECEIVES TRADITIONAL AWARD IN BALTIMORE-WASHINGTON BRANCH CEREMONY

In 1946, the first silver-plated "pot" of the then-"Order of the Pot" (now "Order of Past Presidents") was presented at that year's Baltimore-Washington Branch Annual Meeting to then-National President Walter L. Pinner by the award's creator, namely Past National President Kenneth M. Huston.

Thus, at the Maryland Yacht Club in Baltimore that Spring, was inaugurated the AES tradition whereby each outgoing National President, in the twilight of his administration, is presented with such a "pot" at a traditional ceremony featured at the Annual Meeting of the Baltimore-Washington Branch.

The Order itself was formalized in November 1949, and was structurally reconstructed as the "Order of Past Presidents" in 1954. With the "pot" itself invariably silver-plated, an exception was actually made last year. To honor him specially as National President during the AES's FIFTIETH ANNIVERSARY, then-President Herberth E. Head's "pot," presented to him at a gala GOLDEN JUBILEE Banquet in Washington last April, was gold-plated.

National President Ralph D. Wysong was the recipient of his "pot" at the excellent Annual Banquet of the Baltimore-Washington Branch held at the Park Plaza, Baltimore, Maryland, Saturday, April 9, 1960. Branch President Edward E. Oberland welcomed the large assembly and AES Past President Huston served as Toastmaster and made the presentation. Other National Officers were also present as guests of the Branch. The delightful event ended with a dance following the presenting of door and many other types of prizes.

Gaining a member each year, the "Order of Past Presidents" is currently composed of twenty-one living members, with Duke Wysong due to become the twenty-second in July. Reportedly, the "Order" is about to launch an annual "Past Presidents Award" to be presented to that AES member who, in the opinion of Past Presidents, best deserves it by his deeds for AES.

BALTIMORE-WASHINGTON BRANCH HONORS NATIONAL PRESIDENT WYSONG

(Top, left) National President Wysong receives from Past President Kenneth M. Huston package containing the traditional "pot." (Top, right) National Second Vice President Chester G. Borlet, Branch Secretary Edward J. Roach, Branch Treasurer Lancaster Lowry, Branch Vice President Harold W. Scott, Baltimore-Washington Branch President Edward E. Oberland, National President Ralph D. Wysong, Branch Librarian Joseph Eisenberg, National First Vice President W. Andrew Wesley. (Bottom, left) Branch President Oberland welcomes members and guests to the annual banquet. (Bottom, right) Portion of the banquet room, the head table is in the background.

TO AES MEMBERS

Honored by Supreme Society selection as Host Branch of a National AES Convention on two prior occasions, on each of these two past times, the Los Angeles Branch, through circumstances beyond its control, had to pass up the opportunity because of World War II then Korean War travel restrictions.

Hosting the 47th Annual Convention in Los Angeles, July 24–28, 1960, is, therefore, a delayed opportunity to serve the Society outstandingly and is, therefore, an even greater challenge to this West Coast pioneer Branch of the Society.

Los Angeles is fast getting ready to provide the AES with one of its finest Conventions. It will be a genuine pleasure to welcome each and every one of you to it.

GEORGE J. HETZ
Retiring President
Los Angeles Branch and
Convention Co-Chairman

TO BRANCHES AND BRANCH SECRETARIES

1. **A Return Sheet listing your Branch's accredited Delegates and Alternate Delegates has been sent to you. Via that Return Sheet, you are expected to specify those accredited Delegates and/or Alternates who will be at the Los Angeles Convention to represent you in the deliberations of the Supreme Society. If none of your own Delegates or Alternates surely intend to attend the Convention, you have been asked to select and specify three choices among other Branches from which you wish the Credentials Committee to select one and vest your Branch's proxy in it. Your Return Sheet, to be acceptable to the Credentials Committee, must be signed by your Branch President and Branch Secretary. (Reference: AES Constitution Part I, Art. III, Sections 1 and 2). Due date by or before June 1.**
2. **A complete, certified Roster of your Branch Members in good standing as at June 30, 1960 must be in the hands of the National Executive Secretary on or before July 15, 1960. Upon arrival, his office will properly bill your Branch for Per Capita Taxes covering the fiscal year July 1, 1960–June 30, 1961. Due date for full payment of Per Capita Tax is September 1, 1960. (Reference: AES Bylaws Part I, Art. V, Section 3).**
3. **There are available to you through National Headquarters, 1) The new gatefold Branch Membership combination promotion leaflet and application blank (Free limited quantities); 2) The vaunted booklet, "Milestones of AES" (Free) and 3) AES silver lapel buttons at $1.38 apiece and AES silver Branch Past President buttons at $1.43 apiece.**

REPRINT EDITION OF GLASSTONE BOOK SOON TO BE AVAILABLE FOR PURCHASE

The Society recently entered into an agreement with the Franklin Publishing Company empowering that technical book publisher to print and market a *reprint* edition of the AES's copyrighted book, "The Fundamentals of Electrochemistry and Electrodeposition" by the distinguished authority, Dr. Samuel Glasstone.

Embodying a new Foreword by Dr. Glasstone fronting highly evaluated contents considered still current, the Franklin Company expects that the *reprinted* book will be ready for world sale by it by early Summer.

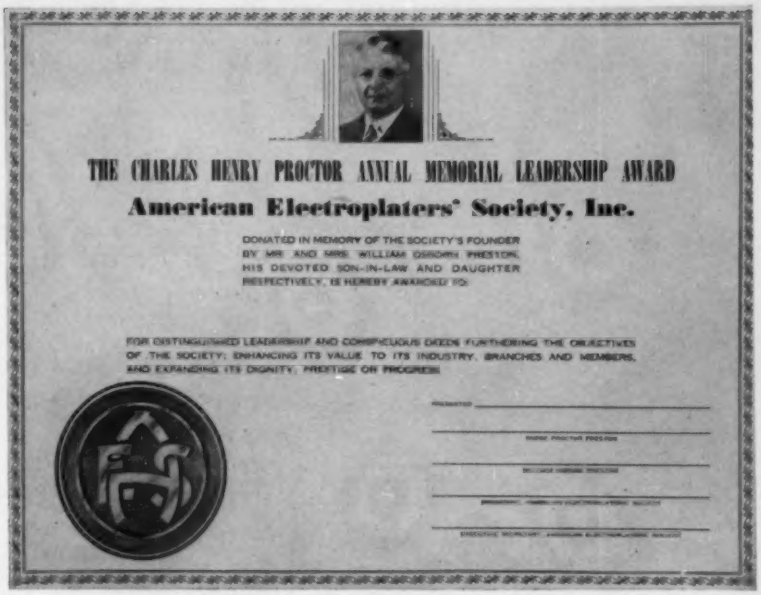
AES members in good standing will be able to order copies through National Headquarters at a lower price per copy. Payment must accompany each such order. Further information will be published in a later issue of PLATING MAGAZINE.

Dr. A. Kenneth Graham

CONVENTION'S OPENING EDUCATIONAL SESSION TO FEATURE GRAHAM PAPER

To be delivered at the Opening Session of the impressive Educational Program of the 47th Annual Convention of American Electroplaters' Society, Inc. in Los Angeles July 24-28, 1960, the second annual "William Blum Lecture" will discuss "Faraday's Laws Applied to Cleaning". Dr. A. Kenneth Graham, second winner of the AES Scientific Achievement Award, the Society's summit technical honor, will present the paper.

The "William Blum Lecture", featuring the Opening Session of the Los Angeles Educational Program, will be delivered before an expected capacity audience in the Golden State Room of the Statler Hotel starting sharply at 2 p.m. Dr. William Blum will serve as Session Chairman.


THE CHARLES HENRY PROCTOR ANNUAL MEMORIAL LEADERSHIP AWARD
American Electroplaters' Society, Inc.
DONATED IN MEMORY OF THE SOCIETY'S FOUNDER
BY MR. AND MRS. WILLIAM OSBORN PRESTON,
HIS DEVOTED SON-IN-LAW AND DAUGHTER
RESPECTIVELY, IS HEREBY AWARDED TO:
FOR DISTINGUISHED LEADERSHIP AND CONSPICUOUS DEEDS FURTHERING THE OBJECTIVES
OF THE SOCIETY; ENHANCING ITS VALUE TO ITS INDUSTRY, BRANCHES AND MEMBERS,
AND EXPANDING ITS DIGNITY, PRESTIGE OR PROGRESS

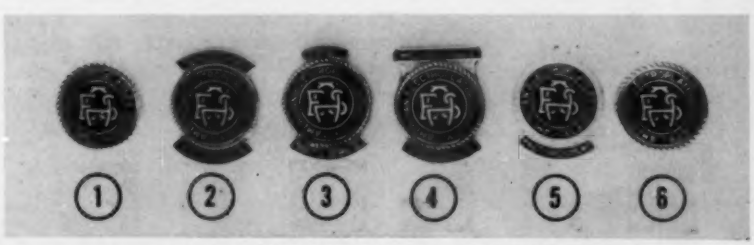
BRANCH AND COMMITTEE NOMINATIONS BEFORE PROCTOR AWARD SELECTION BODY

By April 1 deadline, a number of nominations had arrived from respective AES Branches and Committees at National Headquarters entering the respective deeds, in behalf of AES, of nominees into contention for this year's Charles Henry Proctor Memorial Leadership Award, the Society's highest non-technical, non-scientific honor. These have now gone for consideration and action to the "Charles Henry Proctor Memorial Leadership Award Selection Committee" headed by the National President and including, among others, the Award's donors, namely Mr. and Mrs. William O. Preston, son-in-law and daughter respectively of the late C. H. Proctor, Founder-First President of the Society.

The first winner of that summit annual honor will be announced at the Farewell Banquet of the 47th Annual Convention, Los Angeles, July 28. He will not only receive a $150 cash award but also a handsome laminated scroll, a photograph copy of which is shown above.

The Award is presented annually to that member in good standing of the Society who, during the fiscal year, in the judgment of the Selection Committee, demonstrated the most outstanding leadership qualities among nominees by AES Branches and AES Committees, in furthering the objectives of the Society or enhancing its dignity, prestige or progress.

This year's Selection Committee is composed, besides the donors and National President Ralph D. Wysong, of National Executive Secretary John P. Nichols; Research Committee Chairman James D. Thomas; Order of Past Presidents Chairman Samuel Heiman, Buffalo Branch President Rolland E. Campbell and Past British Columbia Branch President James Lee.



THE BUTTONS AND PINS OF AES

At extreme right (6) is the lapel button (silver) of members of AES, the very muscles and sinews of the Society. Next to it (5) is the Branch Past Presidents button (silver). To its left (4) is the button (gold) of AES Honorary Members (there are thirteen currently living). Further left (3) is the button (gold) worn by AES Past National Presidents. Each National President receives his at the Annual Meeting at which his successor is elected and installed. To its left (2) is the button (gold) worn by the six National Officers during their tenure. And at extreme left (1) is the diminutive pin (gold) presented by the Society to the incoming National President's wife at the Convention Banquet on the evening of her husband's election and installation as the Society's titular head.

EDMUND G. BROWN
GOVERNOR

State of California

GOVERNOR'S OFFICE
SACRAMENTO

GREETINGS TO THE MEMBERS OF THE
AMERICAN ELECTROPLATERS' SOCIETY, INC.

It is a pleasure to extend a warm California welcome to the Forty-seventh Annual Convention of the American Electroplaters' Society.

The Golden State is honored to be host to this important nationwide organization, and its citizens are fortunate to have the opportunity of learning more about the vast scope of its productivity, touching the lives of all of us.

The AES research program, widely recognized for its support of outstanding projects at universities in both the United States and Canada, doubtless will have valuable reports to make of high interest to industry in California and the nation.

To all delegates, their families and friends may I express best wishes for a most successful convention and a pleasant sojourn in Los Angeles.

Sincerely

Edmund G. Brown

EDMUND G. BROWN
Governor of California

YOU AND AES's 47th ANNUAL CONVENTION GREETED BY CALIFORNIA'S GOVERNOR BROWN

LATEST to greet the American Electroplaters' Society, Inc. (AES), and to express a hearty welcome to California to its 47th Annual Convention that will be held in Los Angeles, July 24–28, 1960, is Governor Edmund G. Brown of that great State. His message is presented in full on the facing page. Mayor Norris Poulson has already promulgated a Proclamation declaring the week of July 24–28 as "American Electroplaters' Society Week in Los Angeles".

WHY YOU ARE BEING EXPECTED IN LOS ANGELES

Here is why so many members of AES and their families and guests have decided to make the Los Angeles trip and attend the AES 47th Annual Convention, first west of the Mississippi River in AES's half-century history.

1. It will present an internationally important educational program featuring not only a wide variety of educational papers on various elements of the electroplating, metal finishing and allied arts subject but specially, a) the second "William Blum Lecture", this year to be delivered by Dr. A. Kenneth Graham, b) an eight-paper "Hydrogen Embrittlement in Metal Finishing Symposium", plus an evening forum on that same subject, c) an interesting three-paper session on organic coating and d) a summary of the various active Projects of the AES Research Program by the Chairman of the AES Research Committee himself.
2. It will supplement education with a Convention period packed full of fellowship and fun. The Ladies Program is outstanding—the Children's Program unique. In addition, there will be a family outing to Disneyland—a Sunday night "get-together"—a Monday evening Convention Ball sponsored by the Metal Finishing Suppliers Association (MFSA)—a Wednesday night Floor Show and Dance—a Thursday evening gala MFSA cocktail party—a Thursday night Farewell Banquet, entertainment and dancing.
3. It will be a popularly priced Convention as usual. Registration fee for male and female adults will be $25 per person. For children, the registration fee is $18 apiece, not including the Banquet. Banquet tickets for children are procurable at $7.00 additional per child.

THREE PLANT VISITS AN ADDED ATTRACTION

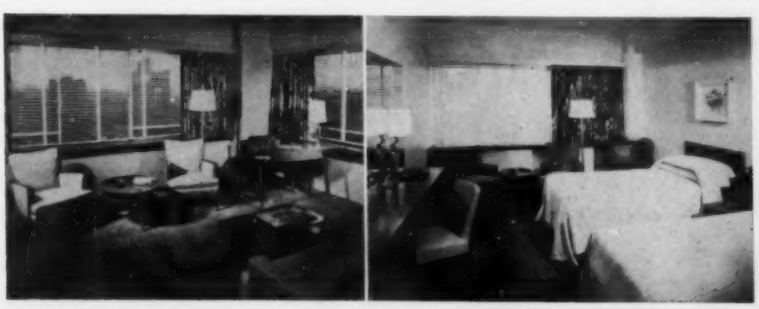
In addition, there will be at least three plant visits though these have not yet been finalized.

One of them is likely to be a visit to the United States Chemical Milling Corporation's plant at Manhattan Beach, California, that, with over 100,000 square feet of manufacturing space devoted exclusively to chemical milling, make it the largest producer of chemically milled parts in the world, especially for the aircraft and missile industries.

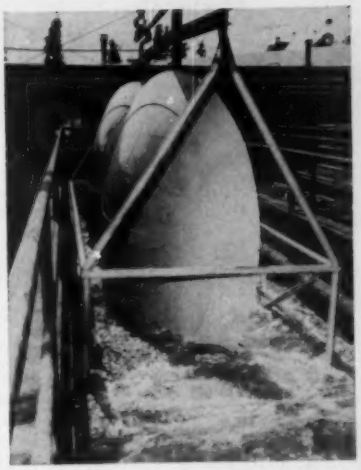
Another plant that will probably be visited will be the million dollar plant of Golden Citrus Juices, Inc. at Fullerton, California. The plant was designed primarily to produce concentrated frozen orange juice. It is also equipped to make pasteurized single-strength juice and pasteurized concentrate.

♦

IF YOU have not yet filed a Hotel Reservation Form or returned the Children's Program return card, you are urged to do so. These were included in the package that you received direct from National Headquarters early in February. Extra hotel forms were also published in the March and April issues of PLATING MAGAZINE for your convenience.



Guest rooms at the Statler Hotel in Los Angeles. (Left) Sitting room of a suite. (Right) A typical bedroom.



Missile bulkheads being chemically milled to close tolerances at the plant of the United States Chemical Milling Corporation, which will be visited during the Los Angeles Convention.

AES BOARD AND COMMITTEE MEETINGS AT 47TH ANNUAL CONVENTION

SUNDAY, JULY 24		**Room**	**Presiding**
9 a.m.	Executive Board	Dallas	Ralph D. Wysong
2 p.m.	Honorary Membership Award Committee	Washington	Leslie L. Diveley
3 p.m.	AES Scientific Achievement Award Committee	St. Louis	Dr. Henry B. Linford
4 p.m.	Credentials Committee	Dallas	Arthur W. Logozzo
MONDAY, JULY 25			
12 p.m.	Branch Secretaries	New York	John P. Nichols
2:30 p.m.	Editorial Board	Boston	John P. Nichols
2:30 p.m.	Midwest Regional Council	Dallas	Leslie L. Diveley
4:00 p.m.	Order of Past Presidents	Detroit	Dr. Samuel Helman
TUESDAY, JULY 26			
8 a.m.	Proctor Award Selection Committee	Boston	Ralph D. Wysong
9 a.m.	Membership Committee	Washington	M. Lester Reynolds
9 a.m.	Public Relations Committee	Detroit	Robert M. Norton
9 a.m	outhwest Regional Council	Dallas	M. E. Browning, Jr.
WEDNESDAY, JULY 27			
8 a.m.	Research Committee Breakfast	Cleveland	James D. Thomas
9:30 a.m.	Research Committee	Detroit	James D. Thomas
9 a.m	Publications Committee	Boston	Dr. Samuel Helman
9 a.m.	Educational Committee	Washington	Dodd Carr
12 p.m	Branch Librarians and Educational Committee	New York	Dr. W. A. Wesley
4 p.m.	Regional Council Chairmen	Dallas	John P. Nichols
FRIDAY, JULY 29			
9 a.m.	Executive Board	Dallas	Dr. W. A. Wesley

47th ANNUAL CONVENTION
AMERICAN ELECTROPLATERS' SOCIETY, Inc.
STATLER HOTEL, LOS ANGELES, CALIFORNIA
JULY 24-28, 1960

TENTATIVE PROGRAM AS OF APRIL 15, 1960

SUNDAY, JULY 24

9:00 a. m.	Executive Board Meeting (All Day)	Dallas Room (Hq. Room)
10:30 a. m.	Ladies' Program. Brunch Honoring National Officers Wives—Sponsored by Los Angeles Branch	Boston Room
2:00 p. m.	Honorary Membership Award Committee Meeting	Washington Room
2:00 p. m.	Scientific Achievement Award Committee Meeting	St. Louis Room
3:00 p. m.	Ladies Program. California Welcome Tea	Garden Room
4:00 p. m.	Credentials Committee Meeting with Executive Board	Dallas Room
8:00 p. m.	Get-Together Party	Golden State Room

MONDAY, JULY 25

8:30 a. m.	Children's Program—Supervised Bus Outing Itinerary includes Forest Lawn Park, Griffith Park, Universal-International Movie Studio, Farmers' Market (includes lunch), "Homes of the Stars" in Hollywood and Beverly Hills, Santa Monica Beach.	Leave from Statler Hotel
10:00 a. m.	Grand Opening Session	Golden State Room
11:00 a. m.	Business Meeting, Supreme Society	Golden State Room
12:00 noon	Branch Secretaries' Luncheon	New York Room
12:00 noon	Ladies Program. Luncheon and Entertainment	Pacific Room
12:15 p. m.	Speakers' Luncheon	Cleveland Room
2:00 p. m.	Educational Opening Session Second Annual "William Blum Lecture" (Dr. A. Kenneth Graham, Second Winner, "AES Scientific Achievement Award".)	Golden State Room
2:00 p. m.	Plant Visit, U.S. Chem Milling Corp., Manhattan Beach	Bus from Statler Hotel
2:30 p. m.	Editorial Board Meeting	Boston Room
2:30 p. m.	Midwest Regional Council Meeting	Dallas Room
2:30 p. m.	Educational Session A "Applying Statistical Quality Control to Plating Processes" "Chemical Milling: Controlled Metal Removal with Chemicals" "Hazards in the Plating Room"	Golden State Room
2:30 p. m.	Educational Session B "Adhesion of Organic Enamels to Electrodeposited Nickel" "Solid Film Lubricants as Organic Finishes" "Magnesium Corrosion"	West Garden Room
4:00 p. m.	Order of Past Presidents' Business Meeting	Detroit Room
6:30 p. m.	Order of Past Presidents' Dinner	Washington Room
8:00 p. m.	Convention Ball (Sponsored by Metal Finishing Suppliers' Association—Admittance by Registration Badge)	Pacific & Sierra Rooms

TUESDAY, JULY 26

8:00 a. m.	Charles Henry Proctor Memorial Leadership Award Selection Committee Breakfast	Boston Room
8:00 a. m.	Speakers' Breakfast	Cleveland Room
8:30 a. m.	Golf Tournament (Sponsored by MFSA)	Los Coyotes Country Club, Buena Park
9:00 a. m.	Membership Committee Meeting	Washington Room
9:00 a. m.	Public Relations Committee Meeting	Detroit Room
9:00 a. m.	Southwestern Regional Council—Organization Meeting	Dallas Room
9:00 a. m.	Educational Session C "Recent Developments in Gold Electroplating" "A Cyanide Bath for Heavy Gold Plating" "Acid Gold Plating" "Precious Metal Plating and Printed Circuits"	Golden State Room
9:00 a. m.	Educational Session D "Outdoor, Accelerated and Galvanic Test Results on Nickel-Chromium Deposits" "A Progress Report on Experiences in Improving the Corrosion Resistance of Automotive Parts" "New Data on the Performance of Nickel and Chromium Plated Zinc Die Castings" "A Study of Variations in Certain Characteristics of Bright Nickel Deposits with Variations in Bath Temperature"	West Garden Room
2:30 p. m.	Annual Outing (Buses leave Statler Hotel)	Disneyland

WEDNESDAY, JULY 27

8:00 a. m. **Research Committee Breakfast** ..... **Cleveland Room**

8:00 a. m. **Speakers' Breakfast** ..... **Buffalo Room**

8:30 a. m. **Children's Program—Supervised Visit** ..... **Bus from Statler Hotel**
Marine Land of the Pacific and Knott's Berry Farm (lunch)

9:00 a. m. **Educational Session E—"Hydrogen Embrittlement in Metal Finishing"**
Symposium ..... **Golden State Room**
"The Metallurgical Aspects of Hydrogen Embrittlement in Metal Finishing"
"On the Mechanism of Transport of Hydrogen across a Metal Interface"
"The Behavior of Hydrogen in Iron and Steel"
"Detection and Control of Chemisorbed Hydrogen during Electrolysis"

9:00 a. m. **Research Committee Meeting** ..... **Detroit Room**

9:00 a. m. **Publications Committee Meeting** ..... **Boston Room**

9:00 a. m. **Educational Committee Meeting** ..... **Washington Room**

12:00 noon **Joint Educational Committee and Branch Librarians' Luncheon** ..... **New York Room**

12:00 noon **Speakers' Luncheon** ..... **Buffalo Room**

12:30 p. m. **Ladies' Program. Luncheon and Don Loper Fashion Show**
(Buses leave Statler Hotel at 11:00 a. m.) ..... **Sportsmen's Lodge, North Hollywood**

2:00 p. m. **Research Committee Meeting** ..... **Detroit Room**

2:00 p. m. **Educational Session F—"Hydrogen Embrittlement in Metal Finishing"**
Symposium ..... **Golden State Room**
"Measurements Pertaining to Hydrogen Embrittlement"
"A New Look at the Hydrogen Embrittlement of Cadmium Coated High Strength Steels"
"Effectiveness of Metallic Undercoats in Minimizing Plating Embrittlement of Ultra High Strength Steels"
"Control of Hydrogen Embrittlement by Plating from Cadmium Cyanide Baths Containing Nitrate"

4:00 p. m. **AES Regional Group and Council Chairmen's Meeting** ..... **Dallas Room**

7:30 p. m. **Round Table Discussion on "Hydrogen Embrittlement in Metal Finishing"** ..... **Los Angeles Room**

9:30 p. m. **Floor Show and Dance** ..... **Pacific & Sierra Rooms**

THURSDAY, JULY 28

8:00 a. m. **Speakers' Breakfast** ..... **St. Louis Room**

9:00 a. m. **Ladies' Program. Tour of the Movie Studios** ..... **Bus from Statler Hotel**

9:00 a. m. **Business Meeting, Supreme Society** ..... **Sierra Room**

9:00 a. m. **Educational Session G** ..... **Golden State Room**
"Magnetic Properties of Electrodeposited Cobalt Alloys"
"Plating of Nickel, Cobalt, Iron and Cadmium from Sulfamate Solutions"
"The Chemical Reduction of Nickel-Phosphorus Alloys from Pyrophosphate Solutions"

9:00 a. m. **Educational Session H** ..... **West Garden Room**
"Cleaning Techniques in the Electronics Industry"
"Solution Transfer in Barrel Plating"
"Chromium Plating of Rifle Barrels"

9:00 a. m. **Children's Program—Supervised visit of Corriganville (Tentative)** ..... **(Bus time to be Announced)**

9:30 a. m. **Plant Visit, McCulloch Corp., Los Angeles** ..... **Bus from Statler Hotel**

12:30 p. m. **Ladies' Luncheon (Dutch Treat) and Shopping** ..... **Farmer's Marke**

1:00 p. m. **Plant Visit, Golden Citrus Juices, Inc., Anaheim** ..... **Bus from Statler Hotel**

2:00 p. m. **Business Meeting, Supreme Society** ..... **Sierra Room**

2:00 p. m. **Educational Session I** ..... **Golden State Room**
"AES Research—Its Purpose and Accomplishments" by Research Committee Chairman James D. Thomas
"New Methods of Chromium Plating Directly on Aluminum"
"Corrosion Protection with Decorative Chromium"
"Experience in the Operation and Performance of Dual Chromium Systems"

6:00 p. m. **Cocktail Party (Sponsored by Metal Finishing Suppliers' Association)** ..... **Wilshire Room**

7:00 p. m. **Annual Banquet and Dance** ..... **Pacific & Sierra Rooms**

FRIDAY, JULY 29

8:00 a. m. **President's Breakfast to National Officers & Families** ..... **AES Executive Suite**

9:00 a. m. **Executive Board Meeting** ..... **Dallas Room**

Remittance must accompany all book orders placed with AES Headquarters.

Hydrogen-Embrittlement Susceptibility of Some Steels and Nonferrous Alloys. J. E. Screwley, U.S. Naval Research Laboratory. Oct. 1959. 28 pages. Order PB 151937 direct from Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C., 75 cents.

A wider variety of metals was tested in this research than in earlier experiments. These included 11 steels (five of them stainless), Armco iron and malleable cast iron, two monels, inconel, copper beryllium, bronze, manganese and aluminum bronzes, beta brass and aluminum alloy. Samples of each, both notched and unnotched, were subjected to severe and prolonged charging with hydrogen and compared with controls. Limits were determined rather than a full curve of "static-fatigue," i.e. the lowest nominal stress capable of causing failure within 100 hours. Notched tensile strength was ascertained by a continuous-loading tensile test. Because of the large variety of materials, the ratio of static-fatigue limit to notched tensile strength of uncharged material was used as a convenient index of susceptibility to hydrogen embrittlement. Thirty photos of specimens after fracture were submitted and evaluated. All but two steels harder than Rockwell C-30 were susceptible to hydrogen embrittlement, some stainless down to C-21. Less hard, low-alloy steels were not so susceptible, while all the nonferrous alloys were not affected at all.

Corrosion of Metals in Tropical Environments: Part 4—Wrought Iron. C. R. Southwell and others, U.S. Naval Research Laboratory. Oct. 1959. 20 pages. Order PB 151852 direct from Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C., 50 cents.

Corrosion rates for new, control-blended, Aston-process wrought iron were tested in the Canal Zone for eight years in comparison with mild, unalloyed structural steel. The experiment is continuing. Representative of conclusions from the data thus far evaluated: Greatest corrosion and pitting of the iron was noted after continuous immersion in sea water. Initial corrosion was greater in fresh water, but began decreasing after four years, virtually ceasing by the end of the eight-year test period. Both corrosion and pitting penetration of wrought iron in sea water also began decreasing during the second four years—the latter by 22 per cent. The effect of millscale in speeding deterioration in salt water was 20 per cent less on wrought iron than on steel; no significant difference appeared in fresh water or sea water at mean tide. Galvanic corrosion was also studied: contrary to expectations, wrought iron became the anode in relation to mild steel. Both marine and inland atmospheres were more corrosive to wrought iron than to any of four low-alloy steels, more than double by the eighth year.

1959 Compilation of ASTM Standards on Copper and Copper Alloys B-5, 720 pages, Hard Cover, Nonmembers $7.50, AES members $6.75.

This compilation contains 137 standards of which 17 are new, revised or have had their status changed since the previous edition in 1957. In addition to standards for cast and wrought copper and copper alloys, the book contains some material on non-ferrous materials for electrical conductors, certain selected specifications on non-ferrous metals and alloys for primary forms of copper, zinc, lead and nickel used in copper-alloy products.

The standards include methods of test, definitions, specifications, classifications, and recommended practices applicable to copper and copper alloys, filler material, pipe, tubes, wire, rod, bar, shapes, die forgings, plate, sheet strip and rolled bar. Copper-alloy ingots and castings are also covered.

Compilation of ASTM Standards Relating to Coated and Uncoated Iron and Steel Sheet and Strip, A-1, A-5. 148 pages, Hard Cover, Nonmembers $3.00, AES members $2.70.

The Compilation of ASTM Standards Relating to Coated and Uncoated Iron and Steel Sheet and Strip is being issued for the first time. There are 21 standards in the volume including 11 specifications for steel sheet and strip, three specifications for metallic coated steel sheet, two specifications for wrought iron sheet, and one specification for metallic coating materials. In addition there are four methods of test.

This publication is intended to present in a convenient form the ASTM standards relating to sheet and strip steel materials, both metallic-coated and plain.

Symposium on Electroless Nickel Plating (Catalytic Deposition of Nickel-Phosphorous Alloys by Chemical Reduction in Aqueous Solution), ASTM Special Technical Publication No. 265, Nonmembers $2.50, AES members $2.25.

In reviewing a publication of this type it is an easy matter to be overly critical of shortcomings. In this connection it is well to remember that the purpose of such a publication is to inform the uninformed with respect to a review of all factors concerned in the process and also to give sources of added information for the more interested.

Generally speaking the publication attempted to cover too much ground with too few words. This leaves the reader with a disconnected feeling. One has considerable sympathy for the several authors because the reference material to be covered was substantial considering the process is comparatively new. Although the publication may be criticized as above, it nevertheless does perform the function of informing the uninformed but interested reader. Those seeking new information or comprehensive operating data will be disappointed since this is not the purpose of the symposium being reported.

The sections covering the chemistry of the process and the patent situation were thoroughly reviewed by Gutzeit. Metzger has covered deposit characteristics reasonably well. Krieg has surveyed the published art adequately on processing procedures. Safranek has summarized applications as comprehensively as possible in view of the newness of the process. The bibliography by Waite appears to be complete as of the date.

Notable omissions, possibly resulting from the absence of published material or from an inadequate survey of the users of the process, were in the opinion of the reviewer:

1. Little, if any, information on the health hazards of the process.

2. Virtually no collated information on the physical aspects of operating the process. (There was a fair body of information provided but it was scattered. Reference was made by one author to the availability of engineering service from the several purveyors of the process but no section was provided by the engineers of one of these concerns.)

3. The subject of masking or stopping off and the related topic of plating allowances was discussed inadequately.

4. The economics of utilization of the process could well have been discussed in greater detail.

W. M. TUCKER

KNOWLEDGE OF INESTIMABLE VALUE IN THESE AES RESEARCH PROJECT REPORTS CURRENTLY AVAILABLE

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INTERSOCIETY NEWS

ASTM PASSES 10,000 MEMBER MARK

Just over 1400 engineers and scientists—second largest attendance in the history of ASTM Committee Week—met at the Hotel Sherman, Chicago, during the week of Feb. 1 to clean up the year's committee work in anticipation of the June annual meeting of the society. In five days' time, 35 of the society's technical committees held 351 meetings of subcommittees and working groups whose staggering task it is to continually keep ASTM standards up to date and useful in a fast-changing world.

The Society, which passed an enrollment of 10,000 members last October, gave special recognition to this event at the committee week dinner by presenting a special certificate to the 10,000th member, Robert J. McCallin, Medusa Portland Cement Co. The certificate was presented by ASTM President Frank L. LaQue, vice president and manager, Development and Research Div., The International Nickel Co., Inc.

A high point of ASTM Committee Week was a Panel Discussion on Appearance of Aluminum Surfaces sponsored jointly by a task group of Committee E-12 on Appearance and Committee B-8 on Electrodeposited Metallic Coatings. A gathering of more than 150 heard the following three discussions with R. V. Paulson, Kaiser Aluminum and Chemical Corp., serving as moderator: "Appearance Measurement from the Management Viewpoint," by R. T. Myer, Kaiser Aluminum and Chemical Corp.; "Gloss Measurement of Transparent and Semi-transparent Films on Aluminum," by W. C. Cochran, Research Dept., Aluminum Co. of America; "Gloss Measurements," by Eric Barkman, Research Dept., Reynolds Metals Co. The speakers discussed the various problems resulting from the need for matching color and gloss of anodized high silicon aluminum alloys. The excellent attendance, as well as the oral discussion, indicated a broad and general interest in this subject.

Appearance measurement techniques for bare and colored aluminum surfaces are necessary in architectural, automotive, and appliance industries. The work of Task Group 4 of Committee E-12 has so far only served to define the enormity and complexity of the problem, the panel concluded.

Both bare aluminum and material finished mechanically, chemically, or anodically are involved in such applications as automotive and appliance trim, architectural or building applications, truck trailers, mobile homes, highway bridge railing and aircraft skin sheet. Variability in appearance in any lot of such aluminum or, for that matter, in any other structural material must be recognized. Advantage can be taken of the variability by suitable design, or its disadvantages can be minimized by proper design.

Commercial instruments that are satisfactory for measuring opaque surfaces are not entirely suitable for anodized aluminum. Nearly all colored anodic coatings are transparent or translucent to some degree thus producing unique decorative effects. This results in two surfaces to be measured. Other special effects encountered in measuring the color of anodic coatings are directional effects (rolling and die lines), presence of lacquer overcoatings, and color "flop." Available color measuring instruments could conceivably be modified to fit the needs for colored anodic finishes.

Gloss, specularity, and numerous related terms define the mirror qualities of a surface when viewed or instrumentally measured under specified geometrical conditions.

♦

AZI RESEARCH REPORTED AT ANNUAL MEETING

North American zinc producers from all over the nation gathered here this morning for the opening session of American Zinc Institute's 42nd annual meeting at the Chase-Park Plaza Hotels, St. Louis, Mo., to hear reports from major representatives of industry, research, and government on matters of importance to the zinc industry.

In presenting a progress report of Institute's expanded research program, Dr. Schrade F. Radtke, research director of the program, reported marked success in two important research areas, and declared that significant progress is evident in many other investigations well underway.

Radtke pointed out that AZI's expanded research was activated in September of 1958 with broad international backing because of intensive competition from such vigorously promoted materials as aluminum, stainless steel, plastics.

"A project of tremendous significance which has contributed markedly to the retention of our market for zinc die castings has been our program on the plating of zinc die castings," Dr. Radtke said. "This program, which was participated in by many platers, plating suppliers, and users of plated zinc die castings, has enabled the AZI program to develop new and improved plating systems, evaluate them, and show that they could provide service life far in excess of former plating systems. In this instance, the need for a newly improved plating system was dictated by the more critical exposure conditions of recent years, compared with the past several decades, particularly relevant on electroplated zinc die castings widely used on modern automobiles.

"We are happy to say that a number of the plating systems which were investigated have shown that these stringent exposure conditions have been met, and that our materials will perform in a superior manner."

Another AZI research project that has met with early success is a study of zinc lithographic printing plates, Dr. Radtke reported. "In this area, we were subject to competition from at least four other materials which were taking away the market which was once exclusively ours," he said. "We are pleased to report that a cooperative program between the zinc rollers and the Lithographic Technical Foundation has developed a new graining system, has permitted us to evaluate a superior new zinc alloy, and to develop new surface treatments which we feel will enable us not only to retain our market, but to move back into areas we had lost."

♦

GLIMPSE OF FUTURE PRODUCTS AT DESIGN ENGINEERING SHOW

American manufacturers will get a glimpse of the products of the future when the Design Engineering Show, largest exposition devoted to research and development, unveils a $10,000,000 exhibit on May 23. The show will run for four days at the Coliseum in New York where it has been held only once before.

Everything that goes into the ultimate product used in the home or factory will be on display. Mechanical components will be shown by 105 companies, electrical and electronic components by 94, power transmission equipment by 65, metallic materials by 61, non-metallic materials by 55, shapes and forms by 53, fasteners and adhesives by 49, finishes and coatings by 23, and 62 companies will have exhibits to show engineering equipment and services.

♦

DECHEMA ANNUAL MEETING

"Werkstoff-Probleme in der chemischen Technik" is the topic for the 1960 Annual Meeting of the Dechema Deutsche Gesellschaft für chemisches Apparatewesen which will take place from June 14 to 16, 1960 in Frankfurt am Main, Germany. This will also represent the 26th meeting of the European Federation of Chemical Engineering.

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INDUSTRY NEWS

NEW H-VW-M CONDUIT FINISHING LINE CUTS FINISHING TIME

An important advance in the steel industry's increasing use of automated equipment has been achieved by Youngstown Sheet and Tube Co. The company has recently increased its conduit production capacity more than 80 per cent by the installation of a fully automatic conduit processing machine.

The new processing line eliminates much handling time, reduces finishing time, bundles tubing automatically, and paints conduit both inside and out. Youngstown is the only manufacturer of conduit to paint the outside of electrolytically plated tubing.

The conduit line, designed and manufactured by Hanson-Van Winkle-Munning Company, Matawan, N. J. is 325-feet long and cuts production time from five hours to less than one hour. The conduit emerges from the machine with a lustrous galvanized finish instead of the dull finish previously produced.

The equipment consists of a series of cleaning, pickling and electro-galvanizing tanks arranged in a straight line. This arrangement enables each piece to move to the next operation or bath in a minimum of time. Forty-five minutes elapse from the conduit is picked up until it emerges as a finished product from the end of the line. The conduit travels at seven feet a minute through the machine.

♦

PACKER MACHINE APPOINTS SALES REPRESENTATIVE

Clifford I. Packer, president of the Packer Machine Co., 456 Center Street, Meriden, Connecticut, has announced the appointment of Munson Welding Sales, Inc., 1718 Erie Blvd., East Syracuse, New York, as sales representative in the upper New York state territory.

The facilities of Munson Welding Sales' Schenectady office, located at 203 Central Avenue, Schenectady, New York, will also be used in the sales operation.

♦

MACDERMID BUILDING NEW LABORATORY

Construction will begin immediately on a new research and development laboratory for MacDermid Incorporated, Waterbury, Conn. The new two-story addition to MacDermid's existing research and manufacturing facilities will have about 7,000 square feet of floor space. The new laboratory will provide additional space for research in chromate conversion coatings, copper plating process, cleaners, and other metal finishing compounds.

♦

AMERICAN METAL CLIMAX CONSOLIDATES HEADQUARTERS PERSONNEL

Headquarters personnel of American Metal Climax, Inc., and its operating divisions moved on March 7 to a modern building bearing the company name at 1270 Avenue of the Americas in Rockefeller Center, New York City. Company executive management and its staff personnel are together under one roof for the first time since the company was formed at the close of 1957 by merger of American Metal Co., Ltd., and Climax Molybdenum Co.

The occupancy entailed the shifting of approximately 600 employes, office furniture and facilities from two locations and was accomplished almost entirely during a weekend. Culminating two years of careful planning of the most minute detail about 450 employes of the corporate executive staff and three of the five divisions were moved from 61 Broadway, in lower Manhattan, and about 150 employes of the other two divisions from 500 Fifth Avenue, in midtown, in a simultaneous transfer to nine floors at the new location.

LEA-RONAL INDUSTRY-COMMERCE CONFERENCE EXHIBIT

(Left) The electroplating industry display of Lea-Ronal, Inc., Jamaica, N. Y., in the lobby of the Department of Commerce Building, Washington, D. C., during the Industry-Commerce Conference under the auspices of the Patent Office of the U. S. Department of Commerce. (Right) In the usual order, attending the opening of the display, Leo J. Bakinow, manager of exhibits; Earle W. Couch, director; Dr. Henry L. Kellner, president, all of Lea-Ronal, Inc.; Robert C. Watson, Commissioner of Patents; Barnet D. Ostrow, general manager and treasurer, Lea-Ronal; Fred Nobel, technical director and secretary, Lea-Ronal. Present, but not in photo, Richard P. Crane, director, Lea-Ronal.

SCHAFFNER INCREASES MANUFACTURING FACILITIES

Gus J. Schaffner Jr., chairman of the Board of the Schaffner Mfg. Co., Inc., has announced the addition of 25,000 square feet of floor space to the corporation's manufacturing facilities.

The Schaffner Mfg. Co., Inc. produces buffs, polishing wheels and buffing compositions.

♦

BUTCHER FORMS MEXICAN SUBSIDIARY

The L. H. Butcher Co., one of the West Coast's largest chemical distributors, has announced expansion into Mexico through the formation of a subsidiary, Butcher-Udylite de Mexico, S.A. de C.V., located in the Industrial Valley section of Mexico City. This is the third major expansion of the company during the past twelve months.

Victor M. Schwartz, executive vice president of Butcher, stated that the new subsidiary was organized to make available to growing Mexican industry the products now distributed by the company through eleven Western States. Serge Fernandez, a veteran Butcher executive, was named manager of the new firm.

V. M. Schwartz

S. Fernandez

Potentials for long-term growth of industry in Mexico prompted the expansion at this time, Mr. Schwartz said.

The company's two previous expansion moves during 1959 were in the Pacific Northwest and in California. Last September Butcher tripled the size of its facilities in Seattle when it opened a new warehouse and office and made plans for additional warehouses in the Northwest area.

During its almost 70 years of operation on the West Coast, L. H. Butcher has expanded from its original headquarters in San Francisco to sales offices and warehouses in Portland, Salt Lake City, San Francisco, Fresno and Woodland, Calif. Other chemical processing plants are located in Brawley, Calif., and Portland.

For its parent company, Butcher's expansion into Mexico brings to a total of 22 the number of foreign countries in which Udylite equipment is sold and serviced.

TIME CHEMICAL MOVES TO NEW PLANT

Time Chemical Inc., Chicago, have moved into their recently completed new plant at 3950 South Karlov Ave., Chicago. The location is in the Crawford Industrial Development of Chicago Central Manufacturing District.

The new Time Chemical Plant is a thoroughly modern structure, styled in the most advanced architectural concepts, and combines every desirable feature of functional efficiency and attractiveness.

Raw materials are received at a fully enclosed railroad siding and at enclosed truck docks. Incoming carload and truck load shipments, whether in bags or drums, are palletized for mechanised handling from the receiving to the storage areas, and proceed with automation, through the mixing and packing operations, to the finished products ready for shipment.

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Products for the metal finishing field are headed by sales manager, Steve Demain. Sales engineer Joe Purtell who joined the staff about a year ago, works with Mr. Demain in servicing this field.

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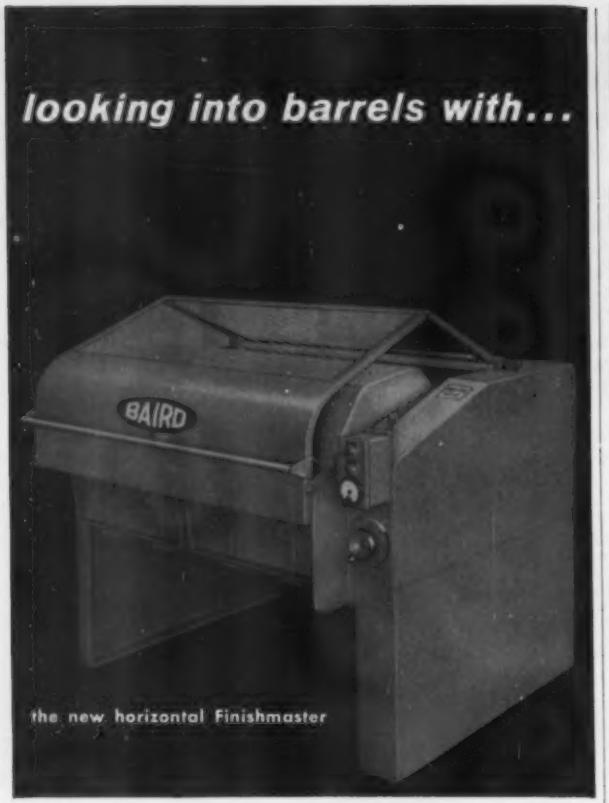

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INDUSTRY NEWS BRIEFS

CARBORUNDUM AND PECHINEY FORM ALUMINUM OXIDE AGREEMENT

An agreement on the manufacture and sale of aluminum oxide has been concluded between Pechiney of Paris, France and The Carborundum Company, Niagara Falls, New York.

The agreement provides that Carborundum will acquire a share of the capital of Les Abrasifs du Sud-Ouest, a subsidiary of Pechiney engaged in the manufacture of fused aluminum oxide crudes and abrasive grains.

The agreement further provides that Carborundum International S.A., Geneva, Switzerland, a subsidiary of The Carborundum Co., is granted exclusive sales rights for the products of Les Abrasifs du Sud-Ouest outside territories under French influence.

♦

AZI ANNUAL REPORT CITES STRONG AUTOMOTIVE USE DUE TO IMPROVED PLATING

Overall U.S. consumption of slab zinc in 1959 climbed seven-one-half per cent over 1958 despite the inroads made by the steel strike on zinc's market for galvanizing.

According to John L. Kimberley, executive vice president of American Zinc Institute in "A Review of the Zinc Industry in the United States During 1959," strong gains were made in the consumption of zinc for brass, die casting, and for French Process zinc oxide.

Mr. Kimberley pointed to excellent zinc consumption prospects for zinc die casting in 1960, noting that zinc's position has been strengthened materially in the automotive market as a result of dramatically upgraded electroplating techniques of special relevance to die cast zinc automotive components. He pointed to the returning trend among major car makers to die cast zinc radiator grilles, dashboard panels, as well as the numerous other automotive parts traditionally made as zinc die castings.

"A Review of the Zinc Industry in the United States During 1959" has just been published by American Zinc Institute, Inc., and a copy may be obtained by writing to the Institute at 60 East 42nd Street, New York 17, N. Y.

♦

NICKEL IN THE YEAR 1959

The availability of nickel in 1959 exceeded demand for the second successive year although there was an estimated increase in consumption of nearly 45 per cent, according to the Bureau of Mines, United States Department of the Interior. This large increase was achieved even though the steel strike caused a marked decrease in the rate of nickel consumption during July through October as compared with the first six months of the year.

Quantity of nickel put into process for producing rolled anode bars, plus Nickel used in casting anodes and nickel cathodes used as anodes in plating operations totaled 28,848,579 pounds.

♦

TIN RESEARCH IN 1959

The annual report of the Tin Research Institute mentions several new lines of investigation in metallurgy, tinplate, electrodeposition, and in organotin chemistry.

In the metallurgical field, systematic investigations are continuing into the alloys of tin with the newer metals titanium, zirconium and niobium. The effects of tin in cast iron and in steels are being further studied and practical trials are being made with cast irons containing prescribed additions of tin.

Bright deposits of tin can be made by electrodeposition using wood tar additions in the plating vat. The Institute is trying to discover which constituents of the tars are effective so that the process can be simplified.

Several new studies of the properties of tinplate are mentioned. A new method of assessing porosity of tin coatings by measurement of flow of current is described.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE
SEL-REX CORPORATION
Nutley, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,894,888, 7/15/59—Electrophoretic Coatings—J. Shyne and W. Fletcher, assignors to Vitro Corporation, New York.

Nitromethane, nitroethane and nitropropane and halogen derivatives thereof are described as the suspending medium for inorganic particles to be electrophoretically deposited.

16 claims.

No. 2,895,814, 7/21/59—Apparatus for Removing Metal—F. Clark, assignor to Turco Products, Inc., Los Angeles, Calif.

An apparatus for directing a stream of etchant against a workpiece is claimed as well as the process.

9 claims.

No. 2,895,845, 7/21/59—Method for Applying Metallic Coatings—J. Jones and W. Potthoff, West Chester, Pa.

Low melting point metal is bonded to higher melting point metal by heating and subjecting to vibratory wave energy.

23 claims, figure.

No. 2,895,888, 7/21/59—Electrolytic Plating Apparatus—D. Varner, assignor to Industrial Nucleonics Corp., Columbus, O.

A strip or wire apparatus is described employing beta radiation to determine the plating thickness. Current control is also provided to control the thickness.

14 claims, figure.

No. 2,895,889, 7/21/59—Low Stress Rhodium—K. Schumpelt, assignor to Sel-Rex Precious Metals, Inc., Nutley, N. J.

Magnesium sulfate in the amount of 10–100 g/l is added to a rhodium bath (2 to 5 g/l of rhodium and 20–100 cc/l free sulfuric acid) operated at 4–20 asf and 20 to 50C.

See also No. 2,895,890 by the same inventor in which 10–100 g/l of magnesium sulfamate is added.

7 claims.

No. 2,897,075, 7/28/59—Buffing Compound Inhibitor—P. Gibson and B. Bogdanoff, assignors to Swift and Co., Chicago, Ill.

The use of at least 0.01 per cent of a fat antioxidant such as di tertiarybutyl, p-cresol, diphenylamine, beta naphthol, etc. in a lime buffing compound containing stearic acid is claimed.

14 claims.

No. 2,897,097, 7/28/59—Preparing Porous Sintered Metal Parts for Plating—M. Smith and H. Latva, assignors to Bunting Brass and Bronze Co., Toledo, Ohio.

The parts are first impregnated with micro-crystallic wax, cooled, then tumbled in a detergent solution containing chips of rock-like material.

3 claims.

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CHURCHILL'S
#501
FINGER-BUFF*

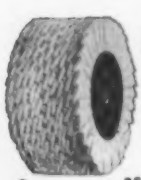
performs
every job a bias-type buff can do
. . . and more too!

#501
A STANDARD BUFF

The Churchill #501 is a standard buff that has **proven** its worth for buffing all standard jobs without excessive wear on any part of the face. This general purpose Finger-Buff* #501, with the 6" wide buff finger (each overlapped by the two adjacent fingers) has **proven** to run at cooler temperatures, to wear down uniformly, to give a better cut and to last longer!

For low cost, cut-color operations it will pay you dividends to investigate this super-flexible Churchill Buff #501 . . . for all standard jobs **PLUS** those special jobs that give bias-type buffs trouble.

• *Churchill Finger-Buffs* are competitively priced. Produced in all sizes from 3" to 21" diameters. For complete information write your problem.*



Geo. R. Churchill Co., INC.
The Original FINGER-BUFFS*
(*T.M. Reg. U.S. Pat. Off.)
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REPRESENTATIVES IN PRINCIPAL CITIES

Please send me FREE catalog of Churchill Finger-Buffs*

Name ..... Title .....
Firm .....
Street .....
City ..... Zone..... State .....
• My special buffing problem is.....

No. 2,897,124, 7/28/59—Pretreating Thorium for Plating—J. Beach and G. Schaer, assignors to USA (AEC).

Vapor blast thorium articles, anodically pickle in 5–15 per cent HCl at 125 to 250 asf, pickle in 5–15 per cent H_2SO_4 then rinse and plate.

2 claims.

No. 2,897,125, 7/28/59—Anodizing Aluminum—J. Franklin' assignor to Sanford Process Co. Inc., Los Angeles, Calif.

Anodize at reduced temperature, establishing a voltage range to produce a measurable oxide coating and increasing the voltage by increments to produce a current obtained at the first voltage.

12 claims.

No. 2,897,584, 8/4/59—Gold Plated Electrical Contact—K. Schumpelt, assignor to Sel-Rex Corporation, Nutley, N. J.

A corrosion resistant schedule is described as a silver deposit on a basis metal followed by a barrier layer of 2.5 to 5.0 millionths of Pt, Ru, Rh and Pd and a gold layer of 10 to 20 millionths of an inch.

2 claims.

No. 2,898,227, 8/4/59—Zinc Gas Plating—F. Drummond, assignor to The Commonwealth Engineering Co. Dayton, Ohio.

Gas plating of zinc by using a thermal decomposable gaseous zinc compound in a carbon dioxide carrier is described.

See also a cleaning and coating aluminum process assigned to same company, No. 2,798,230 with 4 claims and figure and No. 2,898, 234 on forming composite metal bodies with 2 claims and figure. Also No. 2,898,235 with 12 claims.

No. 2,898,250, 8/4/59—Aluminum Surface Coatings—G. Pimbley, assignor to Turco Products, Inc. Los Angeles, Calif.

A process is claimed for producing a colorless chemically bonded coating on an aluminum article which comprises treating said article in an aqueous solution containing a small effective amount of a soluble compound containing unsaturated tetravalent carbon linked to an element of the group consisting of oxygen and sulfur. The general formula is given as

$$-X-C=N$$

where X is an element of the group consisting of oxygen and sulfur.

33 claims.

No. 2,898,251, 8/4/59—Aluminum Coating Steel—R. Treder and W. Batz, assignors to Jones and Laughlin Steel Corp., Pittsburgh, Pa.

Carburize the low carbon steel base first to a depth microscopically identifiable then apply an aluminum coating heating to a temperature at which the iron and the aluminum form a brittle alloy.

14 claims, figure.

Zialite
Reg. U. S. Pat. Off.
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DIRECTLY on ZINC DIECASTINGS, Aluminum, Brass, Copper, Lead, Iron.
TREMENDOUS THROWING POWER, COVERS SMOOTHLY parts made up of several metals.
for HARD CHROMIUM
USE Zialite ADDITION AGENTS
Harder CRACK FREE deposits. Increased throwing power. Less sensitivity to sulfate content. Exceptionally fine results plating anything calling for Decorative or Hard Chrome.
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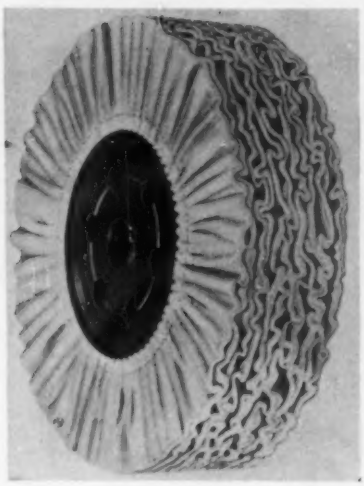
EQUIPMENT AND SUPPLIES



E—501. Buff—Schaffner Mfg. Co., Inc., announces the development and production of a new Amber Extra Life Buff. It is treated with a treatment that insures longer buffing life under the most severe conditions.

It was particularly developed for surfaces that need severe buffing and have a tendency to wear buffs down quickly. The finish attained with use of Amber Extra Life is said to be smooth and scratch free. Recommended by the manufacturer for both ferrous and non-ferrous metals.

E—502. Spray Washing Machine Cleaner—A new, low-cost spray washing machine cleaner which provides low foaming action in cleaning all metals has been announced by Frederick Gumm Chemical Co.

Called Lo-Foam, the non-caustic compound said to have high emulsifying, penetrating and detergent action, not only produces minimum foaming but also counteracts the foaming action produced by the oil, grease or similar type of contaminants being removed from the metal parts.

E—503. Strippers—Detrex Chemical Industries, Inc., has introduced a special line of strippers for new acrylic and epoxy paints. The line is designed to accelerate the process of paint stripping to stopwatch speed. Since all stripping applications are not alike, it is suggested that each application should be submitted for proper recommendation of the new product.

E—504. Alkaline Deruster—A new derusting compound for alkaline plating lines, Rustnix, is being marketed by Cowles Chemical Co.

The new Rustnix will be packaged as individually boxed 50-lb blocks for convenient handling and storage. The block, porous for rapid solubility, is contained in an inner wrapper of polyethylene so it can be handled without gloves. After slitting, it may be dropped into the bath whole, wrapper and all. The compound will disperse into solution by its own action, without stirring.

E—505. Filter Systems—The Sethco Manufacturing Corp. has developed what is claimed to be corrosion resistant and leakproof filter systems, offering space-saving features, and designed specifically for filtering ultrasonic cleaners.

Called the SSI-SR and SSI-SRC Series, these filter systems are said to produce clear filtrates simply and easily. Construction permits filtering solvents as well as both acid and alkaline aqueous solutions. Flows are regulated by a pinch valve, slower flow results in a finer filtrate.

E—506. Airless Spray Gun—When paints and other coatings must be kept at elevated temperatures, this new spray gun permits continuous recirculation of of liquid to maintain desired viscosity. No. 8395-22HPSSTC GunJet, the new Spraying Systems Co. spray gun is built with a high-volume inlet and outlet, so that liquids can keep recirculating through the system both while the gun is being used and during shut-off periods. The

inlet body is totally independent of the valve trigger mechanism. Liquids are in contact only with the body, valve needle, valve seat and orifice tip. Thus the "spray head" outlet of the gun can be completely cleaned . . . and the trigger control mechanism is never contaminated by liquids.

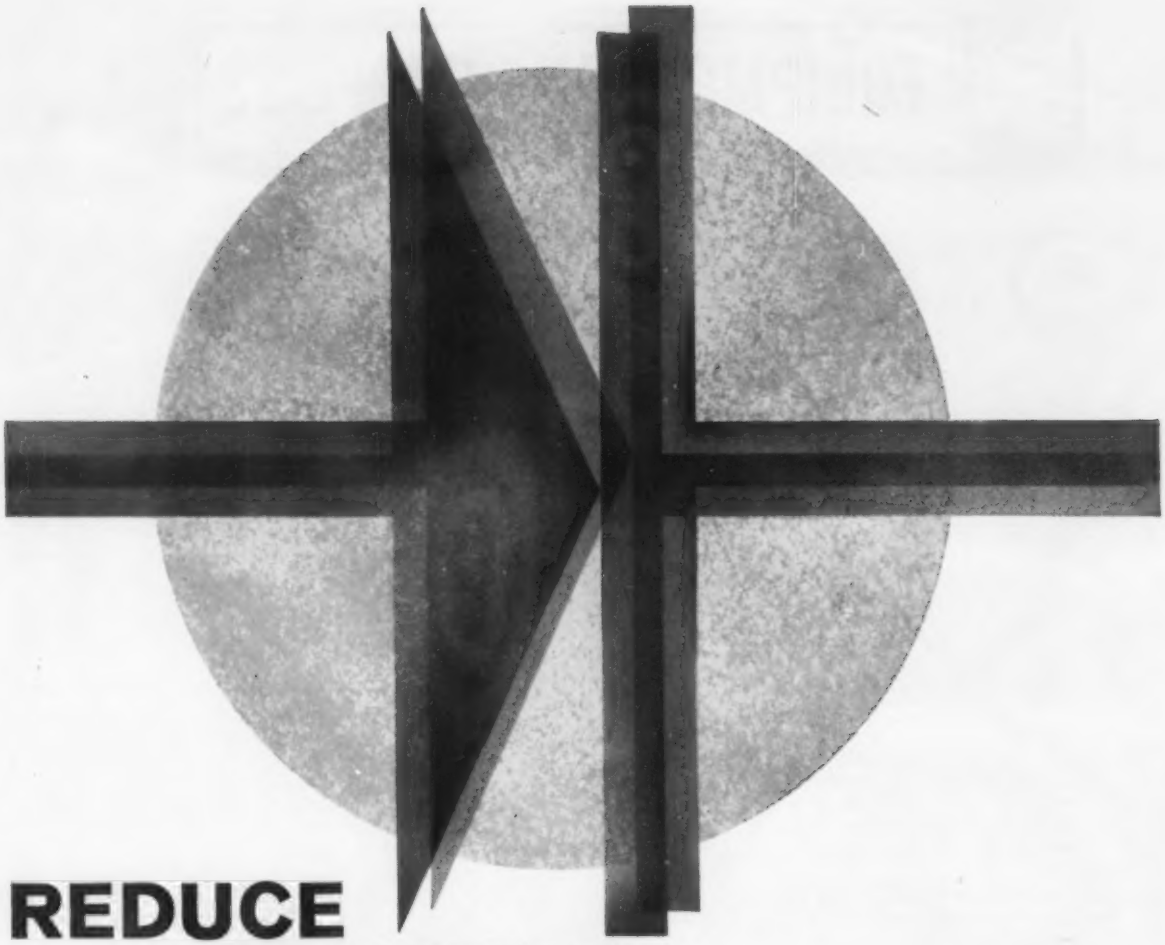
High-leverage trigger action is said to provide finger touch control without hand fatigue at any line pressure up to the 2,000 psi maximum of the gun.

E—507. Ultrasonic Cleaner—A new Circosonic cleaner that combines the advantages of high frequency ultrasonic cleaning, plus mechanical agitation action in a single unit, has been developed by the Circo Ultrasonic Corp. In the new Model 1PA-US, the ultrasonic sound waves loosen the foreign matter from crevices, blind holes and threads, leaving the agitation action to float it away.

A recirculating pump and filter system enables the cleaner to constantly clean its own solution; a temperature control maintains a pre-set temperature throughout the cleaning process.

E—508. Epoxy Polyester Coating—A clear epoxy polyester coating designed for protection of both treated and non-treated decorative aluminum products and surfaces as well as brass and other metals is now available from John L. Armitage & Co. The original luster of the base metal is retained with the use of the coating which is claimed to have a high degree of mar resistance as well as resistance to burns, cracking and staining.

The coating can be applied by either spray or dip. It is baked for 3–15 minutes at temperatures of 350F.



REDUCE RECTIFIER DOWNTIME

Only H-VW-M offers *standardized* rectifiers with *overall protection* against short circuit and overloading! Fact is, H-VW-M's *exclusive* battery of protective systems effectively prevents damage to the rectifier should any single part fail in service. H-VW-M offers 5 different protective systems which are built into new H-VW-M rectifiers. These systems protect against the effects of:

Loss of cooling air • Diode failure • DC short circuits • DC overload • Excessive temperature • Fan motor overload

Find out more about H-VW-M Rectifiers custom-equipped with specialized protective systems to save you maintenance time and money! Write today to:

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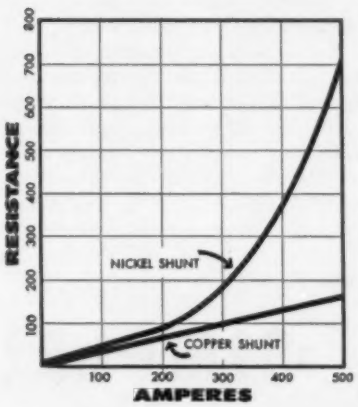
About other H-VW-M electrical equipment

NOW—GENERATOR BRUSH OVERLOAD ELIMINATED

A new H-VW-M Equaload Brush makes overloading impossible. Result: Commutators can now last the life of generators — without resurfacing.

A braided nickel shunt on the new Equaload Brush completely eliminates unequal current distribution because nickel's resistance to current flow increases proportionately with temperature rises. See curve below.



When any brush accepts more than its proportional share of current, the temperature of the shunt rises, its resistance increases and current is immediately distributed equally among the other brushes.

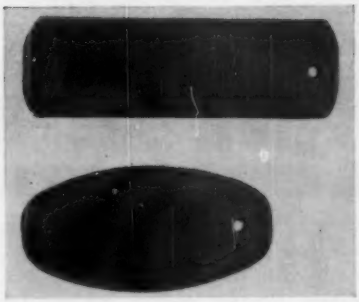
Use of a braided nickel shunt is *exclusive* with H-VW-M. The new H-VW-M Equaload Brush is designed to fit all makes of DC generators.

H-VW-M Form "A" Tank Rheostats — Designed to eliminate all switch failures caused by excessive heating. Standard sizes available with ratings from 30 to 1000 amps. Larger sizes to 5000 amps can be furnished.

H-VW-M Universal Carbon Pile Tank Rheostats — Provide continuous voltage control from fixed plating line voltage source in ranges to 250 amps, 6 to 12 volts.

H-VW-M Motor Generator Sets — Available up to 50,000 amps. Standard voltage ratings are from 6 to 250 volts.

H-VW-M H-VW-M H-VW-M



E—509. Nickel Anodes—Hanson-Van Winkle-Munning Co. has announced that all H-VW-M cast nickel anodes are now Econ-O-Shape. Econ-O-Shape anodes were first marketed in September 1959. A new-shape rolled nickel anode is now in production and commercial use.

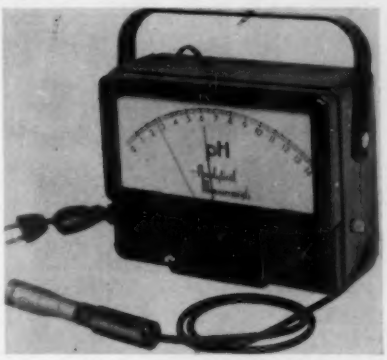
Econ-O-Shape anodes, which are available in any desired length, measure 1-⅝ by 3-¼ in. as compared with the conventional 1-¼ by 3-¼ in. The extra thickness adds 3.2 oz/in. to the Econ-O-Shape anode claimed to result in less proportional scrap loss and longer running time per anode giving operators substantial cost savings. Standard anode bags fit.

The new rolled carbon nickel anode announced by the company is rectangular in shape and measures 4 x 1-¼ in. The new anode is said to offer the maximum proportional scrap loss savings and longest running time between changes.

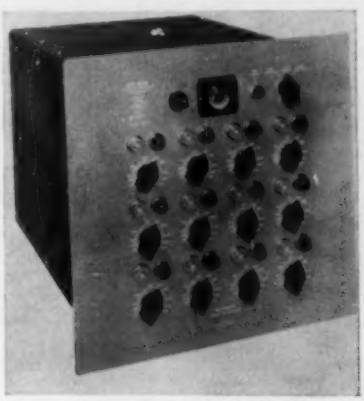
E—510. Grinding Disc—For the first time, disc grinding can now be performed with the work-point in full view of the operator as he grinds. Behr-Manning Co., a division of Norton Co. has developed a special fiber-backed abrasive disc with two parallel straight sides. The product is a rectangular section with a radius at each end. As such a "disc" rotates, a full inch at its outer edge—the area where all disc grinding is done—becomes transparent. Grinding is faster because the abrasive disc need not be moved away from the work point for frequent inspection. Dwell time is reduced because grinding can be confined to an exact area.

E—511. Portable pH Meter—Analytical Measurements, Inc., announces a new concept in *p*H instrumentation—the Model 700 big scale *p*H meter, making it simple to read *p*H values within 0.02 *p*H. Easily portable, (it weighs 5 lb) the *p*H meter can be used wherever a standard 115 volt ac outlet is available.

The originally designed polyethylene electrode probe unit permits the user to



"bring the meter to the sample—not the sample to the meter". This fact enhances the versatility and usefulness of this instrument, since it may be used to make *p*H readings anywhere on the production line and not confined to the laboratory.



E—512. Conductivity Controller—An automatic cycling multipoint conductivity controller for monitoring purity of return steam condensate at up to 12 separate points on a single instrument has been introduced by Industrial Instruments, Inc. An alarm condition at any station is indicated by the lighting of the appropriate red signal light. Designated ARPT-315KA, this instrument is also used to check the contamination of demineralized water in rinsing operations. Suitable for wall or flush mounting, the unit is complete requiring no auxiliary controller.

TRADE LITERATURE

L—501. Filters—An eight-page bulletin on multiple-surface porous stainless steel filters has been made available free from Micro Metallic Division of Pall Corp. The newly revised literature includes information on porous stainless steel filters which can meet a wide range of flow rates, temperatures, pressures and slurries. Several new filter types and sizes are described.

L—502. Sludge Collectors—"Circuline Sludge Collectors," Book 2546, presents Link-Belt Co.'s complete line of six series and 15 types of Circuline collectors available for water, sewage and industrial waste treatment settling tanks. The new 28-page book announces two new series and six new types of collectors.

Replete with detailed engineering drawings and data, the free book contains two tables; one gives the required surface area for various flows and surface loadings for a given settling tank size and the other shows how to determine tank dimensions, volume and weir length.

L—503. Vacuum Metalizing Coatings—A new 45-page booklet on "Coatings for Vacuum Metalizing" has been published by the Logo Division, Bee Chemical Co. This comprehensive booklet describes in detail the application and use of vacuum metalizing coatings which may be applied by spraying, dipping, and flow coating to thermoplastics, thermosetting plastics, metals and glass.

E—504. Tape—Mystik Adhesive Products, Inc., has just published a revised Industrial Manual containing full information on several new products.

The Mystik manual provides comprehensive information on the physical characteristics and typical applications of the company's full line of industrial tapes, bulk adhesives, coatings, and other pressure-sensitive products.

L—505. Adhesives—A new condensed catalog describing the complete Narmco line of adhesives, laminating materials, putties and sandwich core is now available from Narmco Resins & Coatings Co.

A feature of the new condensed catalog is a temperature chart that indicates the upper and lower service limits for each adhesive and laminating material in the Narmco line.

L—506. Overhead Conveyor—New, engineering design features, said to make their "Streamliner" overhead cable conveyor the smooth running, easy-to-install and maintain are illustrated and described in a recently-issued, two-color, four-page folder by Harry J. Ferguson Co.

Descriptions and illustrations in the catalog, Bulletin C-60, include: improved segmented sheaves in the drive units and idler turns and specially designed driving lungs; Idler wheel turns available in 90° and 180° turns; Rapid Dip vertical idler turns for efficient rapid dip into and out of paint or cleaning tanks; prefabricated vertical "S" curves and prefabricated horizontal track "S" curves.

Better Buffing and Polishing?
ANSWER: ALWAYS USE
FORMAX
COMPOUNDS

Formax manufactures a complete line of Buffing and Polishing Compounds in bar, tube and liquid form suitable for all classes of metal, plastic and lacquer finishes. Formax compounds used together with the famous Formax ZIPPO long wearing buffing wheels make a combination that's hard to beat. Our extensive manufacturing, laboratory and testing facilities are always at your disposal.

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One-piece steel, heavily coated with plastisol... no spacer needed. Easy to install. Universal application. Standard sizes stocked. For details, call or write

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L—507. Color Card—United Lacquer Mfg. Corp. has published a color card of industrial finishes. Shown are some 64 shades available in lacquers, synthetics, vinyls, and specialty finishes in a complete scale of lusters at six levels, whereby selective determination of sheen is readily made. Finishes included are wrinkles, metallics, pearlized Hammermark, Uniloids, metallic Hammermark, Golden "Veil" Lacquer, Multakolor, stain, crystal lacquers, crackle lacquers, and clear lacquers.

L—508. Precious Metal Electroplate Testing and Evaluation—The two most important requirements for electroplated articles, resistance to corrosion either by body acids or by air oxidation and resistance to mechanical or abrasive wear, are the subject of the six-page article by Dr. Karl Schumpelt, chief electrochemist, Sel-Rex Corp.

Originally presented as a lecture at the convention and industrial exposition of the Manufacturing Jewelers and Silversmiths of America, Inc., on Oct. 14, 1959 in Providence, Rhode Island, this reprint is taken from the Feb. 1960 American Jewelry Manufacturer.

Dr. Schumpelt discusses thickness measurement, corrosion resistance, tarnishing, oxidation, wear resistance and hardness measurements and recommends tests to be made and the equipment necessary for these tests.

L—509. Heat Exchangers—The Carbone Corp. offers a new 20-page engineering manual presenting their Polybloc impervious graphite heat exchangers.

This manual features full-page illustrations, cutaways, diagrams, and design data. Also among the useful contents are charts, graphs, typical calculations, examples and specifications. The principles of operation are lucid and well demonstrated. At the back of the manual there is a full-page, perforated inquiry-data sheet.

AES THANKS . . .

AES heartily thanks its St. Joseph Valley Branch for that Branch's recent $100 contribution to the AES Research Program.

L—511. Plating and Polishing Quarterly—The latest edition of "H-VW-M Plating and Polishing News", published quarterly by Hanson-Van Winkle-Munning Co. is now available. It is in its thirteenth year of publication. The March 1960 issue contains such articles as: New Nickels; Improved Ruff-L-Buff Binderizing; New Type Generator Brush Reduces Commutator Wear; Processing Conveyors Automate Plating Industry; New Fluid Flux for Galvanizers; Buffing Compound Prices Reduced.

L—512. Tank Preparation Wall Chart—The Protective Coating Division of Metalweld, Inc. has just printed a wall chart entitled "How to Prepare & Design Tanks for Lining".

The chart incorporates diagrams of seven factors to be considered in the proper design and preparation of tanks to be lined to prevent corrosion of the tank or to eliminate product contamination.

New Schaffner bias
BUFFS
give more mileage...
because
...FULLY VENTILATED
...COOLER RUNNING
LOW COMPOUND CONSUMPTION
...FEWER SECTIONS NEEDED
...GIVES LONGER LIFE
...LATHE FACED AND BALANCED
Manufactured and controlled in our own new modern up-to-date Buff plant. Can be tailor made for your toughest buffing problem
MADE BY THE MANUFACTURERS OF FAMOUS AND ACCEPTED SCHAFFNER NO NUBBIN BUFFING COMPOSITIONS
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• CROCUS COMPOUNDS • STAINLESS STEEL COMPOUNDS • ALUMINUM BUFFING COMPOUNDS
• ALL-PURPOSE BUFFING COMPOUNDS • WHITE COLORING COMPOUNDS • NICKEL BUFFING (LIME) • EMERY CAKE • PLASTIC BUFFING COMPOUNDS • TALLOW GREASE STICK
• PUMICE GREASE STICK • POLISHING WHEEL CEMENT • STEEL POLISHING COMPOUNDS
COMPOUNDS MADE IN BAR SPRAY OR PASTE

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'In-Tank' PUMP
Outside FILTER
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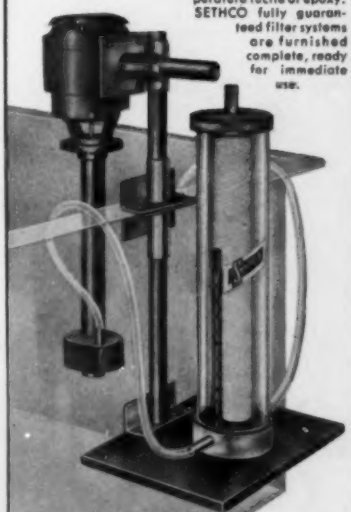
offers universal, self-priming, maintenance-free, leakproof operation

COMPLETE CHEMICAL RESISTANCE AND FULL-VIEW FILTRATION UP TO 250° F.

Filter pumps were not meant to be submarines. SETHCO detachable filter chambers are always outside the tank for full-view filtration, for swift cartridge cleaning without disturbing tank operation. SETHCO 'In-Tank' Pumps can be positioned just below liquid surface or can be equipped with extension strainers to filter at any level from tank bottom up. Pumps can be used for agitation or transfer. Harder working ½ or ¾ hp motors can accommodate all size filter chambers by throttling from open pumping capacities of 900 and 1800 gph to filter chamber capacities of 50 to 1200 gph.

SETHCO 'In-Tank' epoxy pumps are rugged and chemical resistant. They are available with Type #316 S.S., Hastelloy, titanium or epoxy glass pump shafts. Filter chambers are high temperature lucite or epoxy. SETHCO fully guaranteed filter systems are furnished complete, ready for immediate use.



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ARTICLE REFERENCES

By
WILLIAM TUCKER
Eastman Kodak
Rochester, N. Y.

Most of the articles listed here may be obtained by writing to the publications in which the articles were published. Addresses are given at the end of the references for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

64. ANODIZING

a. *TECHNIQUES FOR COLORING ANODIZED ALUMINUM.*
R. V. Vanden Berg.
Products Finishing, March 1960, pp. 32–38.

b. *HOW TO WRITE SPECIFICATIONS FOR ANODIZED FINISHES.*
R. V. Vanden Berg.
Product Engineering, September 28, 1959, *30*, No. 40, pp. 44–51.

65. ELECTROFORMING

ELECTROFORMING A LINER FOR MACH-6 WIND TUNNEL.
G. E. Sutila.
Metal Progress, March 1960, *77*, No. 3, pp. 76–79.

66. ELECTROPLATING

THE ELECTRODEPOSITION OF COPPER, NICKEL AND BIMETAL SHEETS.
E. Carrington.
Electroplating and Metal Finishing, March 1960, *13*, No. 3, pp. 80–84.

67. FINISHING

a. *FLAT POLISHED SHEET FOR AUTO BUMPERS.*
Metal Progress, March 1960, *77*, No. 3, pp. 108–111.

b. *HOW'S YOUR BUFFING AVERAGE?*
Stanley Sax.
Grinding and Finishing, February 1960, *6*, No. 2, pp. 43–45.

68. MANAGEMENT

CALCULATING METAL FINISHING COSTS. 5TH INSTALLMENT.
Bernard Gaida.
Plating Management, March 1960, pp. 11–12.

69. MISCELLANEOUS

AUTOMATIC PLATING OF IRONMONGERY.
Electroplating and Metal Finishing, March 1960, *13*, No. 3, p. 89.

70. NICKEL

a. *SOME PROBLEMS OF AN ACCELERATED NICKEL PLATING PROCESS.*
Larissa Domnikov.
Metal Finishing, March 1960, *58*, No. 3, pp. 44–47.

b. *THERMAL SHOCK RESISTANT PLATING ON BERYLLIUM.*
L. Missel.
Metal Finishing, March 1960, *58*, No. 3, pp. 53–57.

71. ORGANIC

a. *SCIENCE FOR ELECTROPLATERS—55. CYANIDE COPPER ANALYSIS.*
L. Serota.
Metal Finishing, March 1960, *58*, No. 3, pp. 66–68.

b. *PAINT STRIPPING TECHNOLOGY TODAY.*
L. J. Durney.
Products Finishing, March 1960, pp. 39–44.

c. *RUST INHIBITION THROUGH CALCIUM PLUMBATE PIGMENT.*
H. C. Wesson.
Corrosion Technology, February 1960, *7*, No. 2, pp. 37–38.

The following are metallurgical abstracts taken from the Institute of Metals: September 1959.

Note on the Production of Hard-Copper Deposits. H. Spähn and H. Tippmann (Metalloberfläche, 1959, 13, (2), 38–39).—When an addition of p-phenolsulphonic acid of 1 g/l is made to an acid sulphate bath containing $CuSO_4 . 5H_2O$ 250 and H_2SO_4 50 g/l, *p*H <2, and operating at 20 ±1C and a c.d. of 3 amp/dm², the micro-hardness ($HV_{0.05}$ in kg/mm²) of the deposit rises in a manner dependent on the operation (in amp hr/l) of the bath. $HV_{0.05}$ = 110 at the start—compared with 93 for a bath without addition—falls to 100 during the first 10 amp hr/l, then rises slowly to 102 and then rapidly to >120 at, resp., 40 and 100 amp hr/l; thereafter it falls steadily to ~90 at 200 amp hr/l. To produce deposits of constant quality the p-phenolsulphonic acid content of the bath must be analytically controlled; so long as the correct anodic and cathodic c.d. are maintained, decompn. products do not impair bath operation. Increase in hardness of the deposits is associated with an increase in internal stresses and, consequently, a danger of exfoliation.

Hard-Nickel Plating in Russia: Sulphate-Oxalate Bath. A. J. Steiger (Metal Finishing, 1959, 57, (1), 52–53)—Deposits of Ni formed in oxalate electrolytes have high hardness and smoothness. A bath containing $NiSO_4$ and $(NH_4)_2C_2O_4$ is employed at *p*H 7.5–8 and 75–80C with a c.d. of 10 amp/dm². *p*H is maintained by NH_3 addition; no additional brightening agents are required. The rate of Ni deposition is 5–6× that in H_2SO_4 electrolyte.
October 1959, pp. 88, 111

Corrosion Technology
Leonard Hill Technical Group
Stratford House
9 Eden St.
London, N.W. 1
England

Electroplating and Metal Finishing
15 Udney Park Rd.
Teddington, Middlesex
England

Grinding and Finishing
Hitchcock Publications
Wheaton, Illinois

Metal Finishing
381 Broadway
Westwood, N. J.

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WELDED CONSTRUCTION — Note how welds have dissolved or broken in use. Often caused in barrel plating where currents are high and barrel transfer is rapid.

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PRICES—12 cents per inch for basket lengths 18 inches or longer. Side clip 15c extra. Increments 3 inches. Curved containers one size only, 27" for 14" and 16" diameter barrels 15c per basket additional.

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PERSONALS

E. B. THOMPSON, sales manager, has been elected a vice president of Parker Rust Proof Co. Mr. Thompson, a graduate of the Universisty of Michigan, came to Parker in 1938. He was transferred to the New York office in 1940, and later established Parker's Chicago Office. In 1949 he went to Detroit as assistant sales manager, and became general sales manager in 1954.

E. B. Thompson

Al Jocis

AL JOCIS, after a tour in MacDermid's customer service laboratory, has been assigned to the St. Louis territory where he will work with **R. L. NYQUIST.** Mr. Jocis brings to MacDermid a background of five years experience as factory chemist at Dictaphone Corp. and two years as plating chemist at Chemical Plating Co. He also served as supervisor of finishes at Harvey Hubbell.

Mr. Jocis completed formal education at Bridgeport Central High School, attended Emory University at Atlanta, Georgia and is a graduate of the University of Bridgeport.

♦

DR. GUSTAVE KLINKENSTEIN was cited for his outstanding contributions to the construction industry by the Chamber of Commerce of the United States at a special dinner session held in March at the National Construction Industry Conference in Washington, D. C. The scientist received a Certificate of Merit in recognition of his work in the development, application and use of lacquers and synthetic finishes. Dr. Klinkenstein is president of Maas & Waldstein Co., Newark, Chicago and Los Angeles.

He has devoted practically all of his entire professional life to the development, application and use of lacquers and synthetic finishes and is one of the group of scientists responsible for the pioneering work done to produce the great variety of organic coatings as they are known today.

JOSEPH J. MANZELLA has been promoted to regional technical representative of R. O. Hull & Co., Inc. with office and warehouse at 161 Industry Rd., La Habra, California. He will assist Crown Chemical & Engineering Co. personnel in the Los Angeles and San Francisco areas in their representation.

Mr. Manzella served the past two years as salesman in the Detroit office. After Air Force duty, he studied business administration and chemical engineering, and earned a BS degree from Henry Ford College. His prior experience was gained as a quality control chemist in metal finishing operations.

J. J. Manzella

D. Black

DUANE BLACK was recently appointed technical representative by R. O. Hull & Co., Inc. to headquarter in Buffalo. He performs sales and service duties in the northwestern New York and Pennsylvania areas.

Mr. Black served the past several years in Hull research and development activities. He was graduated as a chemistry major from the University of Pittsburgh and has had prior experience in the production plating and steel industries.

DENMAN PENISTON, assistant to the president of Solvay Process Division, Allied Chemical Corp., retired December 31, 1959 after 50 years with the company.

Through the years, Mr. Peniston progressed to positions of increased responsibility, including salesman in the New York Metropolitan area, manager of the New York Sales Branch and director of sales.

He has been assistant to the president since 1953.

FRED P. BOEHM and **CHARLES E. VARN** have been appointed assistant directors of sales of Solvay Process Division, Allied Chemical Corp.

ROBERT E. CLAGETT succeeds Mr. Boehm as Pittsburgh sales branch manager and **G. RICHARD BARCLAY** replaces Mr. Varn as manager of the New Orleans sales branch.

In addition, **JEROME L. HOCHENEDEL** is appointed manager of Solvay's Houston, Texas sales branch, succeeding **S. O. TAYLOR,** who is retiring after 33 years of service with the company.

RICHARD A. MARSHALL is named manager of the Organic Chemicals Section, a post formerly held by Mr. Barclay.

Messrs. Boehm, Varn and Marshall will make their headquarters at Solvay's New York City office, 61 Broadway.

VIRGIL A. ROMITO has been named director of production of Allied Chemical's General Chemical Division.

Until his appointment last year as maintenance manager, Mr. Romito had been plant manager of the division's largest producing facility, Delaware Works at North Claymont, Delaware, for five years.

PRIOR ISSUES OF TECHNICAL PROCEEDINGS AVAILABLE FOR YOUR ORDER

ASIDE from the fast dwindling supply of copies of the AES's world acclaimed GOLDEN JUBILEE EDITION of its book TECHNICAL PROCEEDINGS (1959 Edition), the Society has a limited quantity of the 1958 Edition of that book also available for sale.

Copies of the 1958 Edition are priced at $12.00 per copy domestic, $15.00 per copy foreign. Orders are processed on strictly a "first come-first served" basis. Payment in full must accompany each order.

In addition, the AES has a very limited supply remaining, with steady demand, of the 1957 Edition of its TECHNICAL PROCEEDINGS. These are priced at $10.00 per copy domestic, $12.50 per copy foreign. Payment in full must be received with each order.

In ordering, please make checks payable to American Electroplaters' Society, Inc. Mail orders to:

AMERICAN ELECTROPLATERS' SOCIETY, INC.
American Building, 443-445 Broad Street, Newark 2, N. J.

S. LEWIS DOUGHTY, formerly eastern manager of electrochemical sales of Lea Manufacturing Co., Inc., with headquarters in Waterbury, has been appointed manager of electrochemical sales for the entire country. He will continue to work out of Waterbury. Mr. Doughty, who is a graduate of the University of Washington—1940, has been employed by Lea since leaving Military Service in 1946 and has a varied background with the company. From 1946 to 1951 he was engaged in abrasive specialty product development. From 1951 to the present, he has been concerned with sales and technical service for the electroplating processes developed by Ronal Chemicals and Lea-Ronal Inc.

♦

JOHN GUSS, formerly western manager of electrochemical sales whose headquarters will continue to be at Lea-Michigan, Inc. in Detroit, has been appointed manager of electrochemical service for the entire country. Mr. Guss who is a graduate of Albright College has been with Lea-Michigan since 1953 where his previous duties were as an electroplating field engineer. Before coming to the Lea group, he was chief chemist and metallurgist with Pennsylvania-Ohio Steel Corp. Birdsboro, Pa. 1948 to 1952, and was with Birdsboro Armor Cast, Inc., from 1952 to 1953 in a similar capacity.

RUSSELL M. HELD has been appointed vice president and general sales manager of Tamms Industries Co.

Mr. Held, who has been with Tamms since 1935, had formerly been vice president in charge of the trade sales division. In this new capacity, he will supervise all sales activity.

R. M. Held

A. Neeme

AL NEEME, district sales manager for Michigan Chrome and Chemical Co., has been transferred to the Ohio, Kentucky area. He previously directed company sales on the West Coast.

Mr. Neeme has been with Michigan Chrome and Chemical for many years and has had long and extensive experience in all phases of company operations. He served first as representative for electroplating sales and then for coating sales.

H. STIRLING BLAIR has been named manager of sales and service engineering of Metal Finish, Inc., Newark, N. J.

Mr. Blair is a metallurgical engineering graduate of Rensselaer Polytechnic Institute (1949) and was previously general manager of Pabrico Steel Fabricators, Inc., of Paterson, N. J., and was with the Production Metallurgical Laboratory, Curtiss-Wright Corp.

H. S. Blair

P. V. Ames

PAUL V. AMES has been appointed Eastern sales representative for Vitro Chemical Co., a subsidiary of Vitro Corp. of America. Mr. Ames was previously senior technical sales representative for Spencer Chemical Co.

A graduate of Notre Dame and Harvard Graduate School of Business Administration, he served as an Air Force navigator during World War II. He is a member of the Society of Plastics Engineers.

For Metal Finishers!

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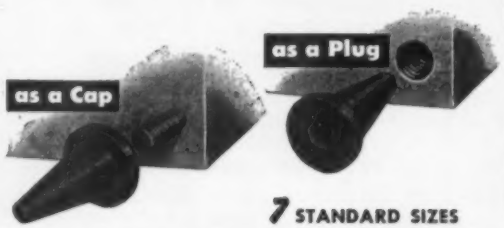

7 STANDARD SIZES

	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

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- LIQUID
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AND

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. . . sent or brought to you by our representative on request. Specify metal, type of wheel and operation.

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P. O. Box 883 Bridgeport 1, Conn.

JAMES M. NORTHRUP has been appointed vice president in charge of sales by United Platers, Inc.

He has served as sales manager for the past three years, and prior to that was a manufacturers representative for several companies. Mr. Northrup is a member of the American Electroplaters' Society.

He is a native Detroiter and graduated from high school at the Elgin Academy in Elgin, Illinois. He attended Albion College and Montana State College. During World War II he served as a lieutenant in the Army Air Force.

J. M. Northrup

R. M. Stewart

RICHARD M. STEWART, President of The American Brass Company, Waterbury, Connecticut, has been elected to the board of directors of MacDermid Inc. Mr. Stewart has been named by MacDermid directors to fill the vacancy left by the retirement of Archie MacDermid, founder of the firm.

In addition to his duties as president and director of The American Brass Co., the newly-appointed MacDermid director also serves as director of The Bullard Co.

Mr. Stewart holds several advisory posts in the state government, including a position in Governor Ribicoff's Economic Cabinet of the Connecticut State Development Commission.

●

CURRY E. FORD has been named director of marketing for National Carbon Co., Division of Union Carbide Corp.

Mr. Ford was graduated from Purdue University in 1933 with a Bachelor of Science degree in engineering, and received his MS degree from Harvard in 1934. He joined National Carbon in 1937 after working for an engineering consulting firm, and in 1953 was named manager of chemical products sales. In 1957 he was made new products marketing manager, from which position he comes to his new assignment.

Reporting to Mr. Ford will be **JAMES KING JR.** as manager of electrode products, **A. W. WOLFF** as manager of industrial carbon products, **W. C. McCOSH** as manager of carbon products, and **W. G. PITT** as manager of new product market development.

E. H. Peterson

B. H. Bailey

EDWARD H. PETERSON, formerly sales manager of the Chemical Division, Magnus Chemical Company, Inc. has been named general manager of the company and its divisions. **BERNARD H. BAILEY,** formerly assistant technical director, has been appointed to the newly created position of manager of the Chemical Division.

Dr. Peterson has served in engineering and sales capacities since he joined the company in 1947. In 1952 he was appointed assistant to the president and in 1954 was made sales manager. He is also a member of the board of directors.

Mr. Bailey joined Magnus in 1952, serving as field service engineer in Massachusetts and New Hampshire. In 1954 he was made assistant technical director at the Magnus headquarters in Garwood.

●

Northwest Chemical Co. announces the appointment of **PAUL V. DUGAN** as representative in the southwest Ohio territory. Mr. Dugan will work with **RICHARD JAGER,** who has served the metal finishing industry in this area for many years. Mr. Dugan has had experience as an automotive chemist and plating shop superintendent.

●

FRANK CHRENCIK, general manager of the Electrochemicals Division of Diamond Alkali Co. for the past four years, has been named vice president-manufacturing.

ARTHUR B. TILLMAN, operations manager of the Electrochemicals Division since January 1957, will succeed Mr. Chrencik as general manager of that division.

In his new post, Mr. Chrencik will assist in coordinating Diamond's manufacturing operations. He brings to this position over 13 years of production and management experience with Diamond, and a total of over 22 years experience in chemical production, engineering and management.

Mr. Tillman, a veteran of over 24 years service with Diamond, will assume overall responsibility for the Electrochemicals Division's administrative, sales, research, technical service, and plant manufacturing activities.

JOHN F. CLAYDON, general manager of the Coated Abrasives Division of The Carborundum Co., was elected vice president of the company by the Board of Directors at a meeting December 17 in Niagara Falls, N. Y.

Mr. Claydon holds a BS degree in chemical engineering from the University of Minnesota, and studied advanced management at Harvard Business School. He joined Carborundum in 1935 as an experimental engineer, became an industrial salesman and then manager of the Detroit sales district. In 1954 he was promoted to sales manager and in 1957 was appointed general manager of the Coated Abrasives Division.

A. Butterer

W. Gordon

AL BUTTERER, technical sales representative in the New York area of MacDermid Inc., has been assigned as regional manager of the entire Middle Atlantic and Southeastern area. Assisting him in the eastern territory will be **HAROLD LAZAAR,** who will continue in the Metropolitan New York area. **ARNOLD KURTH** has been assigned to Atlanta, Georgia to further assist Mr. Butterer in covering the newly organized territory.

●

WILLIAM GORDON, formerly technical sales representative of the Cincinnati territory, has been named regional sales manager of a new territory comprising the states, Ohio, Indiana, West Virginia and Kentucky.

WILLIAM BUCHANAN

William Buchanan, 68, operator of the William Buchanan Supply Company, electroplaters suppliers, Cincinnati, Ohio, died March 29, 1960, at his home.

Mr. Buchanan was associated with the business for 45 years. The firm was started by Mr. Buchanan's father, Thomas, and was called the Thomas Buchanan Supply Company until the elder Mr. Buchanan died 25 years ago.

Mr. Buchanan was an active member of the Cincinnati Branch of the American Electroplaters' Society. He is well known in the electroplating field, especially in the Tri-State Region, and his passing is mourned by all of his friends and associates.

BRANCH NEWS

Total AES Branches U. S., Canada, Australia, May 1, 1960—58.

BLUE RIDGE
Tour Missile Guidance Systems Plant

The March meeting was held on the 18th at the Holliday Inn in Bristol, Tennessee. The attendance was made up of 55 members and guest. **Dr. Nelson Murphy** presided over the business meeting and announced the resignation of **Robert H. Probert,** the Branch secretary-treasurer. The members then elected **Donald H. McGee** to fill this post.

The membership of **Erik F. Barkman** was announced. Mr. Barkman is with the Research Department of the Reynolds Metals Company in Richmond, Virginia.

After the business meeting the group was taken on a tour of the Sperry-Farragut Co., manufacturer of missile guidance systems.

Donald H. McGee
Secretary-Treasurer

BRIDGEPORT
McDowell Discusses Chromate Coatings

The regular business meeting and educational session was held in the Hotel Barnum on Friday, March 11. It was called to order by President **Allen Ferguson.** Two new members were accepted and two applications for memberships presented.

Al Ferguson reported the death of **Armand Faucher,** chairman of the Hartford N. E. Regional committee. **Walter Dyber** has taken over the chairmanship. **Dick Barrett** reported that Bridgeport's three delegates attended the Interim Meeting in Philadelphia. Feb. 11, 1961 has been accepted for the date of the Interim Meeting. A motion was made, seconded and passed that the Bridgeport Branch support the social activity of the Interim Business Meeting equally with the other four Branches. A suggestion that we augment the Interim Meeting with some sort of event disclosed the thought that perhaps a five-Branch Olde Timers Nite be held. Bridgeport would forego the usual February Branch Olde Timers Nite in favor of a regional event. This will be presented to the Regional for consideration. The door prize was won by **William Hyatt.**

The featured speaker of the evening was **George L. McDowell,** administrative assistant to the technical director of Allied Research Products, Baltimore. Mr. McDowell reviewed the progress of chromium since it was first discovered and then proceeded to discuss the various Chromate Conversion Coatings of today. By the use of slides, he illustrated the types of coatings available on plated parts. A letter from Providence-Attleboro Branch announced the coming annual of that Branch wherein they would hold an educational session and dinner on May 21, 1960 in Providence. It is co-sponsored by the University of Rhode Island and the Branch.

BRITISH COLUMBIA
Visit to Oil Refinery

The Feb. 29 general meeting of the British Columbia Branch was in the form of a conducted tour for 29 members and guests through the B. A. Oil Refinery at Port Moody, B. C.

Small groups, under the care of guides were taken through the refinery, and shown the various processes involved in the production of refined oil, and by-products. To further illustrate these processes, films and talks were given by members of the B. A. Oil Refinery staff.

It was an enjoyable and profitable evening, and thanks are due to the B. A. Oil Company and their staff for making it so.

Doug Armstrong
Secretary

BUFFALO
Safranek Talks on Plating of Zinc Die Castings

The Buffalo Branch held its March meeting, Friday, March 4, at the Niagara Manor, Buffalo, N. Y. Eighteen members and one guest braved the inclement weather to attend.

Harold Shapiro, first vice president, presided over the meeting. President **Rolland Campbell** recently underwent an operation and was unable to make the journey from Jamestown at this time. Rolland should be with us in April.

Branch members are wishing a speedy recovery for **Ralph Stemmerich** who has been confined at home.

Two men were elected to membership.

Dick Davis reported on the Interim Meeting in Philadelphia. Buffalo entered a bid for the 1966 National Convention.

George Wolf reported that 60–70 manufacturers will be represented at Technical Societies' Annual Science Fair in Buffalo, in which this Branch is participating.

Dick Davis introduced the speaker of the evening, **William H. Safranek,** assistant chief of the Electrochemical Engineering Division at Battelle Memorial Institute, who spoke on "Improved Plating Procedures for Zinc Die Castings."

The May meeting will be held Friday, May 6. The program will feature installation of the 1960–61 officers by **Dr. W. Andrew Wesley,** first vice president of the National Society, and honoring of former presidents of the Buffalo Branch.

Robert E. Lienert
Secretary

CENTRAL MICHIGAN
Metal Corrosion Explained by Lindberg

Central Michigan Branch held its regular monthly dinner and educational meeting on Tuesday evening. March 1 at the Hotel Hayes in Jackson, Michigan. Twenty eight members attended.

Following the dinner, President **Dave Trafelet** called the meeting to order. Two new members were voted in.

Robert Tobin, librarian, introduced the speaker of the evening, **Ray Lindberg,** corrosion engineer, Reynolds Metals Co., who spoke on "The Corrosion of Metals."

A drawing for a $10 attendance prize was won by **George Connorton** of National File Co.

Following adjournment of the regular meeting a short meeting of the board of directors was held. Final plans for the May 3, 1960 Ladies' Nite Party were completed. President Trafelet appointed **William Mogle** as chairman of the nominating committee.

Homer E. Welch
First Vice President and Publicity Chairman

CHICAGO
Geissman Talks on AES Project 18

The March meeting of the Chicago Branch was held at Stella's Restaurant on Friday, March 11. Four new members were voted into the Branch and eight applications were turned over to the board of managers for approval.

R. Scott Modjeska gave a report on the Seventh Interim Meeting which was held at Philadelphia on Feb. 19–20. This was election night for new officers and **Al Poe** and the publicity chairman were chosen as trusted "tellers" for the counting of the vote cast by the members present. The following members were elected to office for the Branch: President, **Matt Dassinger;** first vice president, **Rudy Hazucha;** second vice president, **Joseph C. Corre;** secretary-treasurer,

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

Paul Glab; librarian, **Simon P. Gary.** The board of managers are **Charles Geldzahler, Ed Stanek, Richard Connors, Robert Waits** and **Christopher Marzano.** The delegates are Paul Glab, **Clyde Kelly** and Charles Geldzahler. The alternate delegates are **Joe Andrus, Russ Haar** and R. Scott Modjeska.

Following the election, **William Geissman,** superintendent of metal finishing at National Lock Co., Rockford, Illinois, gave a report on Project 18, "The Mechanical Finishing of Metal Surfaces." The project has been assigned to Chicago with Clyde Kelly as district supervisor; William Geissman, project director and R. Scott Modjeska as chairman of the project. The tests were made on zinc die-casting. Temperature measurements were made, by use of a thermocouple on the piece part, during the buffing operation. Using the buffing wheel the temperature rose to 250F and when buffing compound was applied to the wheel, the temperature rose to 350F and then stabilized around an average temperature of 250F. Some of the factors which affect buffing are as follows: (1) peripheral speed of the buff (2) linear speed of the piece (3) speed of buff oscillation (4) pressure (5) type and amount of compound applied (6) buff wheel (kind of cloth, size, design and density) and lastly (7) the character of metal. Tests, at the time of this report, indicate that speeds from 4500–5000 rpm and 25-lb wheel pressure gave the best conditions for buffing zinc die cast. More tests are to be run in order to be conclusive of this preliminary result. A very lively question and answer period followed and Mr. Geissman was given rousing applause for his interesting talk.

We are all looking forward to our visit to the Sunbeam plant on Friday, April 8.

Christopher Marzano
Publicity Chairman

CINCINNATI

Trip to Chevrolet Assembly Plant

Forty-two members and guests took an inspection trip through the Norwood, Ohio, Assembly Plant of the Chevrolet Division.

At the time of the trip, the production line was turning out 45 Chevrolets an hour. It was the consensus of the group that the most intriguing phase of the business is the planning and coordination that is required to integrate all of the subassemblies to their proper location on the main assembly line. Particular points of interest along the main assembly line were the equipment used to assimilate road conditions for the finished automobile and the equipment used to check the alignment of the front end.

It is the feeling of the group that a trip to an automobile assembly plant is an evening well spent.

David L. Kaplan
Secretary

COLUMBUS

Faust, Fink and Beach in Corrosion Program

The regular meeting of the Columbus Branch was held at Battelle Memorial Institute, 8:00 p.m. on March 4, 1960, with 25 present.

The business meeting opened with a discussion of details concerning the Tri-State Meeting scheduled for Columbus in April 1961. Also, a motion carried to accept the recommendations of the board of managers with regard to newly revised Tri-State Bylaws.

A review of notes on the proceedings of the recent Philadelphia Interim Meeting led to a motion that the Branch look into the possibility of sponsoring a plating course. Also along an educational vein, volunteers were sought to act as judges for the coming Science Exhibit sponsored by Columbus Technical Council.

Librarian **Hugh Miller** introduced the program of the evening, an educational film and panel discussion. The film "Corrosion in Action," sponsored by The International Nickel Company, was an excellent demonstration of the origin and nature of corrosion and of passivity. **Dr. Charles L. Faust** and **Mr. Fred Fink,** chiefs of the Electrochemical Engineering and the Corrosion Research Divisions at Battelle, respectively, answered questions on corrosion and corrosion protection. The question period was moderated by **John G. Beach.** Refreshments were served through the courtesy of Diversey and the Globe Chemical Co.

L. D. McGraw
Secretary

DAYTON

Saltonstall and Saubestre Present Papers

The regular monthly meeting of the Dayton Branch was held on Jan. 20 at the Biltmore Hotel. **Byron Bowman,** chairman of the annual meeting, announced his appointments: **Larry Hadlock,** co-chairman; **Duane Prosser,** tickets; **Robert Fisher,** educational session; **Robert Ruleff,** entertainment; **Jack Baker,** hotel arrangements; **John Myers,** favors; **Walter Anderson,** advertising and programs; **L. A. Critchfield,** publicity; **Richard Clinehens,** secretary.

Three new members were welcomed into the Branch, and one application was received.

The speaker of the evening was **Dr. Richard B. Saltonstall,** technical director, Udylite Corp., Detroit. He presented a very fine instructive talk on "The Role of Agitation in Electroplating." His talk covered the various methods of solution agitation, their advantages and disadvantages, and their effects at both the anode and cathode.

The evening was concluded with refreshments courtesy of Udylite Corp.

The February meeting of the Dayton Branch was held on the 17th at the Biltmore Hotel. Reports were given regarding the 14th Annual Educational Session and Dinner Dance to be held March 5.

The speaker of the evening was **Dr. E. B. Saubestre,** technical director, Enthone, Inc., New Haven, Conn. Dr. Saubestre discussed "Electropolishing." He mentioned that electropolishing has applications for bright finishing, electromachining and de-burring, metallographic etching, and cleaning. As a general rule removal of 0.001 in. of surface by electropolishing will reduce the surface rms reading to about one-half its previous value.

Dayton Branch Annual Educational Session participants: National President and Honorary Chairman Ralph D. Wysong, Walter L. Pinner, Burt F. Lewis, Byron A. Bowman, Christopher Marzano.

Dayton Branch 14th Educational Session & Dinner Dance Committee. (Rear Row) Holle Luechauer, Jack Baker, Bennie Cohen, Larry Hadlock, Walter Anderson. (Front Row) Richard Clinehens, John Myers, Byron Bowman, Robert Fisher, Duanne Prosser.

After reviewing some of the electropolishing methods, their advantages and limitations, he described a high current density hydrochloric acid-acetic acid solution which he had used for some special applications.

Refreshments following the meeting were through the courtesy of R. O. Hull & Co.

Wysong Attends; Marzano, Lewis and Pinner Speak at Annual Meeting

The Dayton Branch was honored on March 5 when **Ralph D. Wysong,** National President, presided as honorary chairman of the 14th Annual Educational Society and Dinner Dance. The speakers and their topics were: **Christopher Marzano,** chief chemist, Amphenol Borg Corp., "How to Plate Difficult Metals"; **Burt F. Lewis,** technical director, Northwest Chemical Co., "Modern Metal Cleaning"; and **Walter L. Pinner,** manager plating service, McGean Chemical Co., "Preparation of Steel for Electroplating and Copper-Nickel-Chromium Coatings."

This highly successful affair was attended by 532 at dinner which was followed by an excellent floor show and an evening of dancing. The Joint-Suppliers Cocktail Party preceding the dinner and their hospitality bar and lunch following the floor show contributed immeasurably to the enjoyment of the occasion.

L. A. Critchfield
Publicity Chairman

DENVER

Carter Discusses Duplex Chromium

The Denver Branch met March 9 at the Oxford Hotel. There was an attendance of 23 members at the dinner and 30 members and guests at the meeting which followed. **Bob Martin,** president, announced the programs for the next two meetings which include a tour of The Martin Co. plant in April and a tour of Coors Brewery in May.

Following the business meeting **C. Willard Carter,** Metal and Thermit Corp. discussed chromium plating. Details were given on their CR 110 and CF 520 baths and their advantages over conventional 100:1 baths. Duplex chromium plating using the CR 110 followed by CF 520 was outlined and additional corrosion resistance stressed.

Elmer Schuster
Secretary

DALLAS-FORT WORTH

Gilbert Speaks on Vacuum Metalizing

The regular monthly meeting of the Dallas-Ft. Worth Branch was held on Wednesday, March 16 at Howard Johnson's Turnpike Restaurant with 33 members and guests in attendance. After the fellowship hour and dinner, President **Myron Browning** called the meeting to order. A letter from The Dallas-Ft. Worth Council of Scientific Societies was read to the group, which requested that a representative of our Branch participate in the National Science Fair. **D. L. "Don" Allie** offered his services as our representative to this worthy project. Browning then requested a report from **Fred Howard,** second vice president, as to the progress being made on the bylaws for our local Branch. A door prize drawing was held by **J. D. "Jack" Haler** for a man's wrist watch. **H. E. "Ed" Patterson** held the lucky ticket. The chair appointed a nominating committee: **T. E. Betz,** chairman; **R. F. Walton, John Ladd** and Jack Haler committee members. At this point, the members had the privilege of voting on three new members to our Branch.

Don Allie introduced the speaker for the evening, **M. B. Gilbert** of The Frederick Stokes Co., who presented a talk on present and future applications of Vacuum Metalizing. His talk was augmented with slides and a question and answer period.

T. E. Betz
Recording Secretary

HARTFORD

Faucher Eulogized; Nadel on Plating of Die Castings

The regular Branch meeting was held at the Veterans of Foreign Wars building in Elmwood on March 21, and 52 members and guests were present. Preceding the

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meeting **Arthur Logozzo** delivered the Eulogy in honor of our late President **Armand Faucher** who passed away suddenly on March 4.

The guest speaker for the evening was **Milton Nadel** of Berkeley Industries whose subject was "Practical Aspects of Plating on Zinc and Aluminum Base Die Castings."

Various pretreatments of aluminum to increase the adherence of paint coatings by cleaning the surface or roughening it or leaving a suitable deposit on it, were discussed. Some of those covered were: Alrok process, Deoxidine, Alumox, anodizing, Bonderizing, etc. It was pointed out that the last water rinse should be not higher than a *p*H of 5.5 to have good adherence. The Zincate treatment seems to be the most favored prior treatment to plating on aluminum. The aluminum is then gold or silver plated for radar or jewelry purposes, chrome and tin for antifriction purposes, brass for rubber adherence and zinc for corrosion improvement.

For a good finish on zinc castings one must consider the (1) casting and material, (2) preliminary finishing and machining and (3) cleaning. Important to keep the surface density or skin, and plate as soon as possible after polishing. Avoid over etching and cleaning.

The technical chairman for the evening was **Ralph McCahan.**

Stanley Platoz
Secretary

INDIANAPOLIS

Lewis Explains Metal Cleaning

Forty members and guests of the Indianapolis Branch of AES attended the March 1st meeting at the Construction League. **Les Reynolds,** president, opened meeting with roll call and introductions. The reports of secretary and treasurer were read and accepted. One application for membership was accepted.

Report on the Tri-State meeting was given by **Quentin Shockley** and also **Lee Howald** of the Cincinnati Branch. All plans are now made and 300 tickets already have been sold.

The report on the Interim Meeting at Philadelphia was read in full by the secretary, a delegate to the Philadelphia meeting. The report was commented on by **Ed Bruck.** Our president gave his report on National Membership.

The board of managers and the president recommended that we elect representatives to the Tri-State. **Bert Hawhee** will become the senior member. In a motion by Mr. Shockley, **Robert Stewart** was elected the junior member.

Since the location of the 1962 Interim Meeting has not been decided, the Indianapolis Branch will think about this and present the data at the April meeting. A committee was appointed by the president to assemble the data. It is composed of Quentin Shockley, chairman; **Robert Smith** and **John May.**

The program was introduced by **Mark Trook,** librarian. **Bert Lewis,** of Northwest Chemical Co., gave "Modern Methods of Metal Cleaning." Since "dirt is matter out of place," metal cleaning is the re-arrangement. Mr. Lewis gave us several charts and arrangements showing the cleaning of die casting. Temperature ranges and *p*H of various cleaning cycles were explained. Many questions from the group followed at the close of the program.

The April meeting will be with the Indianapolis Branch of the Electrochemical Society. The speaker will be **Dr. Charles Faust** of Battelle Memorial Institute of Columbus.

Edna Rohrabaugh
Secretary

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LOUISVILLE
Chromium Plating Presented by Johnson

The Louisville Branch held its regular meeting at Hasenour's Restaurant Thursday, Feb. 18, with 28 members and guests present.

All members and guests were introduced.

The following nominating committee was appointed: **Stan Beyer,** chairman; **Kenneth Reifsteck, Art Oertle, Joe Muscarella.**

A request was read from Rochester Branch for our support for **Frank Beuckman** for national third vice president.

For "Industry Night" **Art Oertle,** of the American Saw & Tool Co., gave a very interesting talk on his company's products and methods of finishing. A large display augmented his talk.

The speaker for the evening was **A. Albert Johnson,** of the Metal & Thermit Corp. He gave the background of chromium plating and its greatly improved methods for increasing its corrosion life. He pointed out the comparison of duplex nickel and duplex chromium. Slides accompanied his talk, showing the different types of corrosion tests being used and their results.

K. C. Reifsteck
Publicity Chairman

LOUISVILLE
Wodehouse Talks on Anodizing and Plating of Aluminum

The regular meeting was held Thursday, Jan. 21, at Hasenour's Restaurant with 38 members and guests present.

Lee Howald, of Cincinnati Branch, reported on the progress of Tri-State Regional Meeting.

During the "Industry Night" part of the program, **Norris Shake,** of the iHllerich & Bradsby Co., gave a short talk on the history, prefinishing and plating of golf clubs.

Harlan Bowsher introduced **R. A. Wodehouse,** of Alcoa Aluminum Co., as guest speaker.

His talk began with a discussion of anodizing as one of the best protective finishes for aluminum. He then covered the oxide formation, dyeing and sealing of the anodized finish. Plating of aluminum was also covered. Mr. Wodehouse then briefly talked about other finishes for aluminum, such as paint and porcelain enamel. A color film illustrated the varied finishes and uses for aluminum.

K. C. Reifsteck
Publicity Chairman

MOHAWK VALLEY
Kerr Speaks on Finishing Aluminum

The Feb. 11 business meeting at the Golden Tea Pot Inn, New Hartford, N. Y., was opened with introduction of guests by President **Jack Bension.**

Second Vice President **Merle Ihrie** called attention to the Interim Meeting at Philadelphia and urged everyone to attend if possible.

Bension again reminded the members about the Los Angeles Convention, July 24–28, and cited the many advantages of attending.

One new member was elected.

First Vice President **Robert Stewart** reported that the Annual Spring Dance will be on May 21, at Twin Ponds Country Club.

Librarian **Ted Duvall** introduced the speaker of the evening, **Jack Kerr** of The Reynolds Aluminum Co., who spoke on Finishing Aluminum.

The speaker noted that aluminum is usually shipped from the mills with nicely finished surfaces and protected with suitable materials. Considerable cost in finishing can be saved if proper care is exercised in handling and storage.

Once pits or scratches occur, considerable metal must be removed to eliminate them. Anodizing is one of the economical means of preserving aluminum and colored anodizing is attractive.

He named five essential points necessary to produce good anodizing: (1) Proper alloy, (2) secure racking, (3) clean parts, (4) correct and constant temperatures, (5) seal in C.P. water over 200F.

He noted that racks of aluminum and titanium are the most suitable.

Samples were passed around for examination and many questions were answered.

A guest, **John J. Bunsic,** and his wife were introduced and Mr. Bunsic described some of the many opportunities available in connection with the Empire State Regional Meeting at Elmira, N. Y. on April 29 and 30.

Henry J. Crouse
Secretary and Treasurer

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MOHAWK VALLEY

Plant Tour at Kelsey-Hayes Co.

The March 10 meeting was opened by President **Jack Bension.** It was held at Twin Ponds Country Club, New York Mills, N. Y., with 26 in attendance.

Librarian **Ted Duvall** announced that the April meeting speaker will be **Dr. F. A. Lowenheim.** The topic will be "Tin and Tin Alloy Plating."

Duvall then announced with regret that the speaker for this evening, **W. A. Helbig** was ill and could not be present. However, a substitute activity would be a plant tour arranged by First Vice President **R. A. Stewart.**

The meeting was recessed to meet at the Yorkville plant of The Utica Drop Forge & Tool Division of Kelsey-Hayes Co.

Some of the tools were displayed and described by Stewart. It was surprising to note the variety of tools. Custom made, special purpose tools are manufactured in large numbers at the Yorkville plant.

Some of the operations of interest to metal finishers were: automatic polishing and buffing, Wheelabrating, vaporblasting, sandblasting, tumbling and deburring, black oxide, nickel and chromium plating, and plastisol coating. Unique arrangement of machines to utilize a minimum of space and to expedite flow was of interest.

A vote of thanks to Bob Stewart and The Kelsey-Hayes Co. brought the tour to a close.

Henry J. Crouse
Secretary and Treasurer

MONTREAL

Gray Discusses Filters

The regular monthly meeting of the Montreal Branch was held at the Sheraton Mount Royal Hotel on March 14. The meeting was called to order by President **R. Takeuchi,** with 28 members present.

Our president then called upon **N. Cronin** to introduce **R. M. Gray Jr.,** of Industrial Filter & Pump Mfg. Co., speaker for the evening. Mr. Gray gave a very informative talk on various tank filters and answered many questions. He was thanked on behalf of the Montreal Branch by **J. Charles.**

R. W. Niggemann
Secretary

NEWARK

Branch Incorporates; Sustaining Members Present; Geissman Describes AES Project 18

The March meeting of the Newark Branch was held on the 18th, with 150 members in attendance.

Five men were elected to membership and one application was accepted.

Don Foulke stated that the annual Red Cross drive had started and it was moved and passed that the Branch contribute $25. He also reported that the Technical Societies Council of New Jersey annual meeting was scheduled for March 29 and urged attendance.

John Kosmos presented to President **Meyer** the incorporation papers of the Newark Branch along with the official seal of the Branch documenting the incorporation of the Branch as of Feb. 29, 1960.

Gus Bittrich presented to the members the slate selected by the nominating committee, and President **Meyer** then announced that the three top positions were being contested by **Dodd Carr, Herbert Tilton** and **William du Fosse. Robert Preston** (Philadelphia Branch), **Robert Probert** (Southeastern Branch) and **Bill Geissman** (Rockford Branch) served as tellers. It was moved and passed that the Secretary cast a ballot for those unopposed. The election of officers opposed was done by secret ballot and each member passed his ballot to the secretary who approved each voting as in good standing.

While the tellers counted the ballots, Librarian **Korbelak** introduced **Bob Horrocks** of Bendix Aviation who presented a Timely Topic talk on "Fused Tin Plating." He explained that fused tin provided a good appearing, easily solderable coating which can be handled without staining and has good shelf-life for a vast number of parts. All metals are preplated with nickel or copper, followed by a tin deposit of 0.0001 to 0.0003 in. in a potassium stannate bath. Then they are thoroughly rinsed, flowed in a proprietary oil, and cleaned in an emulsion cleaner.

The following officers were elected: **John Banta,** president; A. Korbelak, first vice president; **H. Martin,** second vice president; **G. Wagner,** treasurer; **D. Foulke,** secretary; **F. LaManna,** librarian; **E. Wagner,** sergeant-at-arms; **G. Bittrich, W. Grigat,** F. Meyer, **G. Reuter, C. Struyk,** board of managers; **W. A. Wesley,** G. Wagner, D. Foulke, delegates; W. Grigat, A. Korbelak, F. LaManna, alternate delegates.

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Fred Meyer presented his annual report and called upon National First Vice President **W. A. Wesley** to install the officers just elected. He advised the officers to use the Officers' Manual to assist them in doing their jobs and urged bringing more younger men into committee work, pointing towards the Convention in 1963.

President John Banta presented a Past Presidents' pin to Fred Meyer and congratulated him on a year of fine accomplishment. He then turned the meeting over to Librarian Cy LaManna, who asked Don Foulke, as National Vice Chairman of Research, to welcome the sustaining members present: **Gunner Stendahl,** American Smelting and Refining; **Bob Ehrhardt,** Bell Telephone Laboratories; **John Gumm,** Frederick Gumm Chemical Co.; **Myron Diggin,** Hanson-Van Winkle-Munning Co.; Eugene Wagner, Hy-Grade Electro Plating Co.; W. Andrew Wesley, International Nickel Co.; and **Morris Messing,** Sel-Rex Corp.

Don then briefly discussed the Research Program and urged other companies in the area to support the program.

William Geissman, project director for AES Research Project 18, then described the way the project committee operated in the case of No. 18, the objectives of this project and what had been done to date. Bill explained that a poll of interested people indicated most interest in a study of the Mechanical Finishing of Die Castings so this was the first undertaking. He described the buffing machine built for the project and outlined progress that has been made thus far.

D. Gardner Foulke
Secretary

NEW YORK

Blumenfeld Talks on Hard Anodizing

President **Joseph Rembecki** called the March 11 meeting at the Hotel Statler to order.

A new member was accepted.

The members were notified of the passing away of Honorary Member **William J. Schneider.** "Cyanide Bill" as he was known was one of the founding fathers of the Society and was always ready to help platers on their shop problems. A moment of silence was kept in honor of him.

Motion by **Justus A. Stremel** to set aside a page on the minutes in honor of deceased was unanimously carried.

Motion made and carried to recommend to the National Society the week of June 28 through July 1 as dates for the 1965 convention to be held in New York.

Officers nominated were: President—Joseph Rembecki, first vice president—**Jack Weiner,** second vice president—**Arthur Carlson** and **Isidore Freidman,** librarian—**Martin Pollack,** financial secretary—Isidore Friedman and **Leo Sovzis,** recording secretary—**Fred Saras,** sergeant-at-arms—**Daniel Paris, Arthur P. Karren,** board of managers—**Phil Bruno,** secretary-treasurer—**Milton Nadel.**

Motion was made and carried to present all members in good standing for 25 years or more with a pin so engraved, on the first meeting following the Metropolitan Regional.

Motion was made to start a movement to make remaining Founding Fathers of AES, Honorary Members of the National Society.

New York Branch will propose that for future conventions preprints of papers to be presented should be sent to members, and at convention the speaker would present a resume of his paper and have general discussion of same, making it more interesting and less time-consuming.

Librarian **Martin Pollack** took over for Good and Welfare, and introduced **Martin A. Blumenfeld** who spoke on "A New Method for Hard Anodizing Aluminum." Normal hard anodizing is accomplished with the use of constant current dc power. Films of greater thickness may be formed,

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using the constant wattage method, than those processed using a constant current density. Of alloys tested, 61ST gives the best properties to hard coat deposits and its use in general is recommended where this finish is specified. The dc voltage breakdown of the hard coating on 61ST is approximately 56 per cent higher than the a.c. voltage breakdown. Temperatures below 10C appear to have no appreciable effect on abrasion resistance while those in excess of 10C considerably soften the deposit. Hard anodic coatings are much more abrasion resistant than conventional sulfuric anodizing. Sealing of the anodic coatings tend to soften them.

Fred Saras
Recording Secretary

PHILADELPHIA

Castellano Discusses Nickel Bath Troubles

The regular meeting was held at the Engineers' Club on March 28 and was called to order at 8:45 p.m. by Branch President **Cogan.** About 50 members and guests were present. Following introduction of guests by First Vice President **Hoffmann, Eugene N. Castellano,** Lea-Ronal, Inc., spoke on "Trouble Shooting in Nickel Baths."

Mr. Castellano stated the basic formula for bright nickel baths was the Watts bath, modified with primary and secondary brighteners. He felt a nickel chloride content of 3 oz/gal sufficient for anode corrosion, although 6 oz/gal gave more conductivity. A content higher than 6 oz/gal was not necessary for optimum results; this also produced corrosive conditions for lead or stainless steel tank accessories in contact with the solution. He preferred cast carbon nickel anodes for bright nickel solutions.

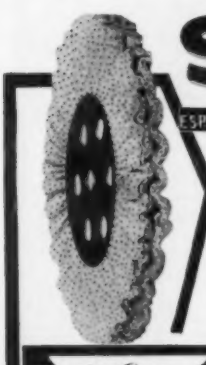
He recommended the following copper strike on steel and brass before nickel for added assurance of a clean surface: copper cyanide—4, Rochelle salts—12, sodium cyanide (free)—1 oz/gal, room temperature, 6 volts. A 30-second strike in this solution gives a bright deposit.

Mr. Castellano described the use of Chlorox, a proprietary bleaching solution containing 5.25 per cent sodium hypochlorite, as a quick treatment for organic contamination in nickel baths. It is used at the rate of 1 gal/1000 gal for low contamination to 10 gal/100 gal for high contamination, instead of carbon treatment. It is mixed thoroughly into the bath by adding through the filter pump and after thorough mixing the bath is ready to plate.

Mr. Castellano also discussed the methods of bath purification when contaminated with iron, copper, zinc and chromium, which followed recognized practices. He stated that should additions of wetting agent over the stated amounts not eliminate deposit pitting, hydrogen peroxide at the rate of 1 qt/1000 gal should be tried.

He recommended anode bags be boiled in a solution of the wetting agent, rinsed, acid dipped and rinsed before using in the nickel solution. Some anode bags have taken up to 20 per cent of the wetting agent in the solution before any becomes effective in the solution.

Following Mr. Castellano's paper, the secretary read the minutes of the meetings held since the January regular meeting. The treasurer gave the financial report. The Welfare Committee sent flowers to members **Love** and **Devlin** in the hospital. It was announced that **Donald Marsh** had been in the hospital since



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March 27; he would be sent flowers. Five membership applications were received and referred to the board of managers. The secretary announced the transfer of **Andrew Catchmark** from the Detroit Branch; the Baltimore-Washington annual affair on April 9; the enrollment of Cleanite Products as a Sustaining Member was announced.

Mr. Cogan spoke about the next annual meeting to be held in the Benjamin Franklin in February, 1961. The date and place met no objections from the floor. Also discussed was the possibility of the Branch bidding in due time for the 1969 AES Convention and Exposition, should an Exposition be held that year. This produced a favorable reaction.

I. Wm. Marcovitch
Secretary

PHOENIX

Metal Finishing Symposium

Arizona's first Metal Finishing Symposium was held Saturday, March 26, at the Chemistry Building of Arizona State University.

Dr. Clyde Crowley, Dean of Chemistry, A.S.U., was the toastmaster and started the program promptly at 9:15 a.m.

Morning sessions were led by **Seymour Thomas,** Cortez Chemical Co.

J. Howard Craft, Metals and Controls Laboratories, Los Angeles—"Analysis of Plating Solutions" and **Eugene Bosl,** Alert Supply Co.—"Testing of Plated Deposits" were the morning speakers.

A feature of the luncheon was presentation of the MFSA award to Branch President **Bill Griff** by **John Mullarkey** of Cortez Chemical Co.

The luncheon address, "Function of Engineering Today," was presented by **Dr. Beakley** in the absence of Dr. Lee P. Thompson. Afternoon sessions were led by **Gordon Perrine,** Clico Laboratories.

A most informative panel discussion, Customer-Vender Relationships, was held first. Panel members were: **Al Korbelak,** Sel-Rex Corp., as supplier of processes and equipment; **Al Espinosa,** general manager, Chem. Research Co., representing the job plating industry; and **A. C. Bjornberg,** purchasing agent, Air Research Corp. **Dr. Castle Riser,** A.S.U. was moderator.

The final paper, "Chemical Finishes," was presented by **A. H. Kelly,** process engineer, Hughes Aircraft Corp.

Plated parts, supplies and equipment were exhibited.

An attendance of 90 was a tribute to the hard work of General Chairman **Paul Wible,** members of his committee and cooperation of our members. A special thanks is due Dr. Crowley and Arizona State University for furnishing the facilities for the meeting.

James E. Weaver
Secretary

PROVIDENCE-ATTLEBORO BRANCH CO-SPONSORS ELECTROPLATING SEMINAR

An Electroplating Seminar co-sponsored by the Providence-Attleboro Branch and the Division of Engineering Research and Development of the University of Rhode Island will be held at the University, Kingston, R. I., on Saturday, May 21, 1960.

PROGRAM

10:00 a.m. —**Registration and Coffee Hour**

10:30-12:00 —**Tours of Campus**

12:00- 1:00 p.m.—**Luncheon—University Dining Hall**

1:30- 5:00 —**Technical Sessions**

"Acid Pickling and Bright Dipping"
Dr. Walter Meyer, president of Enthone, Inc. New Haven, Connecticut

"Anodizing of Aluminum as Compared to Electroplating"
Byron Abedon, vice president of research and development, Engineering Products & Specialities, Inc., Pawtucket, R. I.

3:00 —**Coffee Break**

"Some Physical Properties of Electrodeposited Gold"
Eldridge Camp, I.B.M. Corporation, Poughkeepsie, New York

"Contaminants in Cyanide Copper Solutions and Their Control"
Dr. Eric Laue, Research Director, MacDermid Inc., Waterbury, Connecticut

5:30- 6:30 —**Cocktail Hour—Larchwood Inn, Wakefield, R. I.**

6:30- 7:30 —**Dinner at Larchwood Inn**

SAGINAW VALLEY

Ladies Night Dance

The annual Ladies Night Dinner Dance was held on Feb. 6, at Zhender's Hotel in Frankenmuth. Approximately 350 branch members and guests attest to the tremendous success of this non-technical session. Our thanks to Ladies Night Chairman, **Dale Reigle.**

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1.0–2.8 pH	10.5–13.0 pH
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Bellinger Reviews Coated Abrasives

The March technical meeting was attended by 55 Branch members who enjoyed a Frankenmuth chicken dinner at Zhender's Hotel.

Lee Bellinger, representing the Behr-Manning Co., presented two excellent movies. "The Manufacture of Coated Abrasives", illustrated the manufacture of the many coated-abrasive products currently being used by the metal finishing industry. Movie No. 2 showed the advantages of coated abrasive belts.

Jim Reed, entertainment chairman, supplied another, above average, sports movie, while **Harvey Gibson** held on to his door prize donated by **Eldon Brisson** of J. J. Siefen Co.

The Saginaw Valley Branch donated a $10 prize to the Bay County Science Fair. This prize will be given to the student with the best exhibit in the field of electrochemistry.

H. F. Hooker
Recording Secretary

SAN FRANCISCO

Marcum Speaks on Leveling

Trevor Harry, the Branch President, opened the meeting of the San Francisco Branch at 8:00 p.m. Thursday, March 10.

C. E. Snelgrove, Branch secretary, introduced the guest speaker, **Elburn Marcum,** the West Coast technical director of the electrochemical dept. of the DuPont Co. Mr. Marcum, who has many years experience in electrochemicals and copper plating, spoke on "Leveling Copper Cyanide Plating". The talk was accompanied with slides and a question and answer session.

C. E. Snelgrove
Secretary-Treasurer

ST. LOUIS

Snow Cancels Meeting

The regular monthly dinner meeting was not held due to a 8-inch snow fall that made the streets very bad for travel. The speaker was to have been **Kermit Diebold** of the Peerless Lacquer and Chemical Co., St. Louis. Since he is a member of our Branch and did not have to come from out of town, it made it easy to call off the meeting.

Our speaker for next month will be **Frank Macioce** of Industrial Filter and Pump Mfg. Co.

Ward Kelly
Secretary

SPRINGFIELD

Stiller is Speaker;
New Officers Elected

The Springfield Branch met on Monday, March 28, at Blake's Restaurant for the regular monthly meeting. Dinner at seven was followed by the business portion of the evening.

Chairman of the activities committee, **Wayne Sanders,** gave a report on the turkey shoot. Although, financially, the program was not a huge success, all those who attended claimed a good time, and the committee broke even. Branch members who won door prizes were **Bob Eades** and **Bill Houlihan.** Shoot winners were **Ed Finnie** and **Frank Schulz.** Grand shoot prize went to **Frank Crowley.**

The nominating committee, with **Edward F. Koetsch Jr.** as chairman, gave a report and presented a slate of nominees for officers for the 1960-1961 Season. The following officers were elected after due procedure: President, **Alexander R. Salmond;** first vice president, **Louis E. Dupuis;** second vice president, **Donald R. Barber;** secretary, **Henry L. Heissfeld;** treasurer, **George H. Mongeau;** librarian, **Leo A. Diamond.** Those elected to the board of managers are: **Elery C. Gibson,** Edward F. Koetsch Jr., **Joseph F. Mitchell, Donald W. Gemme** and **Richard J. Hieronymus.**

Frank J. Crowley made a motion to install these officers at the Annual Golf Outing which is scheduled for some time in June. The motion was seconded by Charles F. Griffin Jr. and the membership voted unanimous approval.

Robert J. Girard eulogized president of the Hartford Branch **Armand J. Faucher,** who died suddenly Friday night, March 4. Bob asked for a minute of silence and prayer.

The business session was adjourned, and the meeting turned over to Librarian Dupuis. The speaker, **Frank P. Stiller** of Sandoz, Inc., formerly was associated as production manager with Heller Hostess Ware of White Plains, N. Y. His subject: Coloring of Anodized Aluminum.

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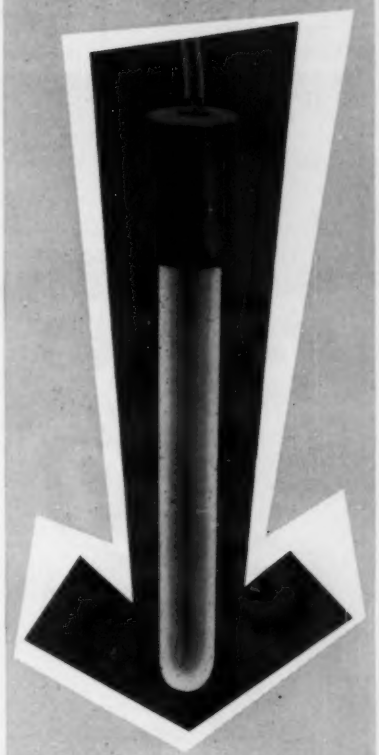

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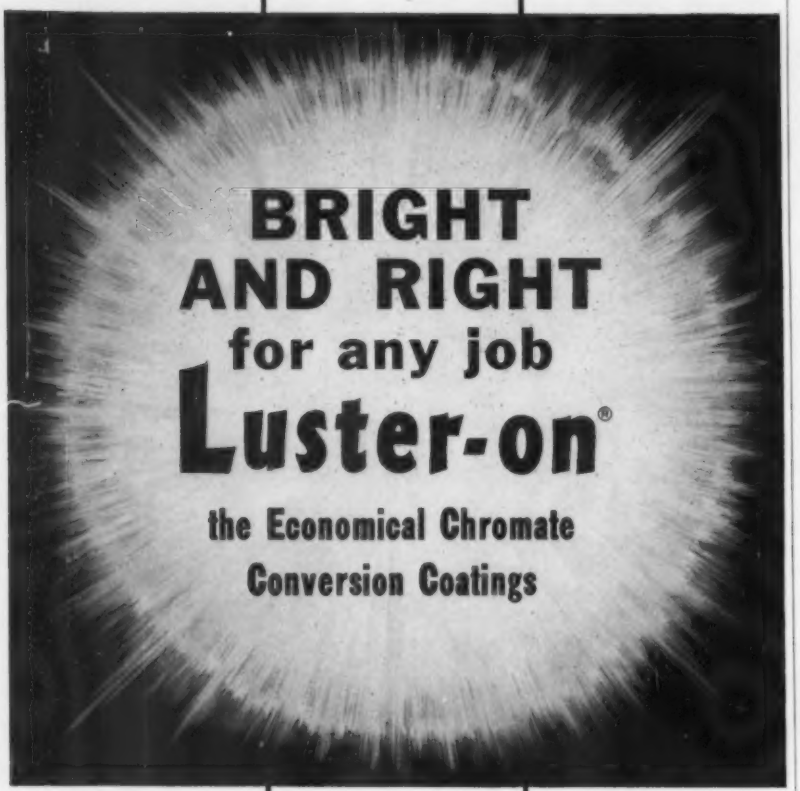

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Frank discussed the qualities and varieties of types of aluminum and other metals and their comparative receptiveness to dyes. He explained why some castings are more difficult to dye, and require specialized treatment. Emphasis was placed on purity of water, and not to be too hot nor too cold. Also stressed was the difficulty of matching colors under various circumstances. Tank linings for dyes to be of certain specified materials. The entire subject was very informative and one in demand, as attested by the large attendance and the increased number of guests.

Henry L. Heissfeld
Secretary

WATERBURY

Valentine Party

The Waterbury Branch held its annual Valentine's Day Party at the Waterbury Country Club on Saturday Evening, Feb. 6. The event featured a Branch sponsored cocktail party followed by a fine dinner and dancing to the music of Arnold DiPietro and his Orchestra. A fine time was had by all.

F. A. Schneiders
Publicity

WATERBURY

Electrostatic Spray Painting Explained

The Branch held its regular meeting at the Roger Smith-Elton Hotel on Thursday, March 10. President **Frank Tirendi** called the meeting to order at 8:00 p.m. **James Kennedy** announced that tickets were on sale for the 21st New England Regional to be held in Hartford on April 23. The nominating committee brought in the following slate of officers for consideration: President, **William Giesker;** first vice president, **Louis Porretti;** second vice president, **Albert Griffith;** librarian, **Patrick R. Mazzamaro.** In addition to these nominations the following were nominated Delegates, William Giesker, Frank Tirendi, **Marty Sternfels;** and Alternate Delegates, **Michael Orient, Clarence Foster** and **Ralph Colter.** Additional nominations are welcome from the floor.

Two new members were welcomed into the Branch and presented with membership certificates.

The speaker of the evening was **Emery P. Miller** of The Ransburg Electro-Coating Corp. who spoke on the evolution and development of the electrostatic paint spray process. He explained the principles and showed a film of many working installations. It was an excellent presentation.

F. A. Schneiders
Publicity

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Only "Help Wanted" and "Situations Wanted" will be accepted. Rates: $.20 per word, minimum $5.00. AES Branch Members and Members-at-Large only, in good standing, are entitled (for personal use only) to a total of three free advertisements in any twelve-month period as of first insertion. Last day for inserting advertisements is the 10th of month preceding date of publication. When answering advertisements please address as follows: Box number, PLATING, 445 Broad Street, Newark 2, N. J.

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Grand Rapids: E. R. Breining from Dayton
Hartford: J. Courtemanche to Capital District
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New York: E. W. Schultz from San Francisco
Saint Louis: E. Bright to Memphis-Midsouth

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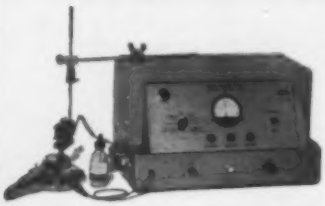

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FUTURE MEETINGS

AMERICAN ELECTROPLATERS' SOCIETY

May 3,	1960—**British Columbia Branch Meeting,** Lougheed Hotel, Vancouver, British Columbia.
May 4,	1960—**Seattle-Puget Sound Branch Meeting,** Seattle, Washington.
May 5,	1960—**Portland Branch Meeting,** Portland, Oregon.
May 6,	1960—**San Francisco Branch Meeting,** San Francisco, California.
May 6,	1960—**Buffalo Branch Annual Meeting,** Niagara Manor, Buffalo, N. Y.
May 7,	1960—**St. Louis Branch,** Annual Spring Banquet, Ambassador Hotel, St. Louis, Missouri.
May 7,	1960—**Toronto Branch,** Annual Regional Meeting, Sheraton Brock Hotel, Niagara Falls, Ontario, Canada.
July 24-28,	1960—**47th AES Annual Convention,** Hotel Statler, Los Angeles, Calif.
July 24,	1960—**Executive Board Meeting,** Statler Hotel, Los Angeles, California.
August 6,	1960—**Detroit Branch Stag Day,** Glen Oaks Country Club, Farmington, Michigan.
September 16,	1960—**Second Metropolitan Regional Technical Session,** Newark Host Branch, Robert Treat Hotel, Newark, N. J.
September 17,	1960—**Boston Branch 24th Annual Educational Meeting and Banquet,** Hotel Statler, Boston, Mass.
October 29,	1960—**Second Annual Midwest Regional Conference,** University of Notre Dame, South Bend, Indiana. St. Joseph Valley Host Branch.
February 3-4,	1961—**Third Annual Dixie Regional Technical Session,** Hotel Roanoke, Roanoke, Virginia. Blue Ridge Host Branch.
February 11,	1961—**Eighth Interim Meeting,** Supreme Society, Statler Hotel, Hartford, Connecticut. New England Regional Council, Host.

MASTERS' ELECTRO-PLATING ANNUAL BANQUET ON MAY 14

The grand ballroom of the Hotel Plaza in New York City will again be the scene of one of the plating industry's most enjoyable social events on Saturday, May 14, namely the Forty-Second Annual Banquet of the Masters' Electro-Plating Association.

The Hotel Plaza, in its fountain plaza setting at the entrance to Central Park, is ideally suited to Masters' annual affair. Prior to the banquet, a reception and cocktail party will be given at 6:30 p.m. During the evening, the customary award will be made to the "Plating Man-of-the-Year" selected by the association. Entertainment and dancing will climax the evening.

Tickets are $25 per person and can be obtained from A. T. Marinaro, executive secretary of the association, 59 East Fourth Street, New York 3, N. Y.

June 18-23, 1961—**48th AES Annual Convention,** Hotel Statler, Boston, Mass.

June 25-28, 1962—**49th AES Annual Convention,** Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.

June 24-27, 1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City. N. J. Sponsorship Newark Branch.

June 15-18, 1964—**51st AES Annual Convention,** St. Louis, Missouri.

June 28-July 1, 1965—**52nd AES Annual Convention,** Statler Hotel, New York, N. Y.

INTERSOCIETY

May 9-13, 1960—**American Society for Metals,** 2nd Southwestern Metal Exposition and Congress, State Fair Park, Automobile Building, Dallas, Texas.

May 14, 1960—**Masters' Electro-Plating Association,** 42nd Annual Banquet, The Plaza, New York, N. Y.

June 26-July 1, 1960—**American Society for Testing Materials,** 63rd Annual Meeting (with Apparatus Exhibit), Chalfonte-Haddon Hall, Atlantic City, N. J.

July 22-24, 1960—**National Association of Metal Finishers,** 5th Annual Convention, Hotel Statler, Los Angeles, California.

July 24, 1960—**Metal Finishing Suppliers' Association,** Board of Trustees Meeting, Hotel Statler, Los Angeles, Calif.

July 25, 1960—**Metal Finishing Suppliers' Association,** Annual Luncheon and Meeting, Hotel Statler, Los Angeles, Calif.

September 7-15, 1960—**2nd Coliseum Machinery Show,** Chicago Coliseum, Chicago, Ill.

September 26-30, 1960—**Instrument Society of America,** 15th Annual Meeting; Instrument-Automation Conference and Exhibit, Coliseum, New York, N. Y.

October 9-13, 1960—**The Electrochemical Society,** Fall Meeting, Shamrock Hotel, Houston, Texas.

October 12-14, 1960—**American Vacuum Society,** 7th National Symposium, Cleveland-Sheraton Hotel, Cleveland, Ohio.

October 17-21, 1960—**American Society for Metals,** 42nd National Metal Exposition and Congress, Trade and Convention Center, Philadelphia, Pa.

November 8-11, 1960—**Society of Die Casting Engineers,** First National Die Casting Exposition and Congress, Detroit Artillery Armory, Detroit, Mich.

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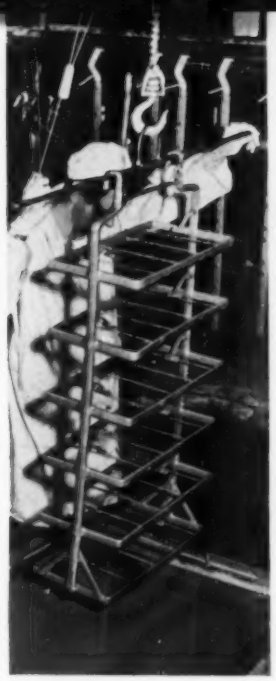

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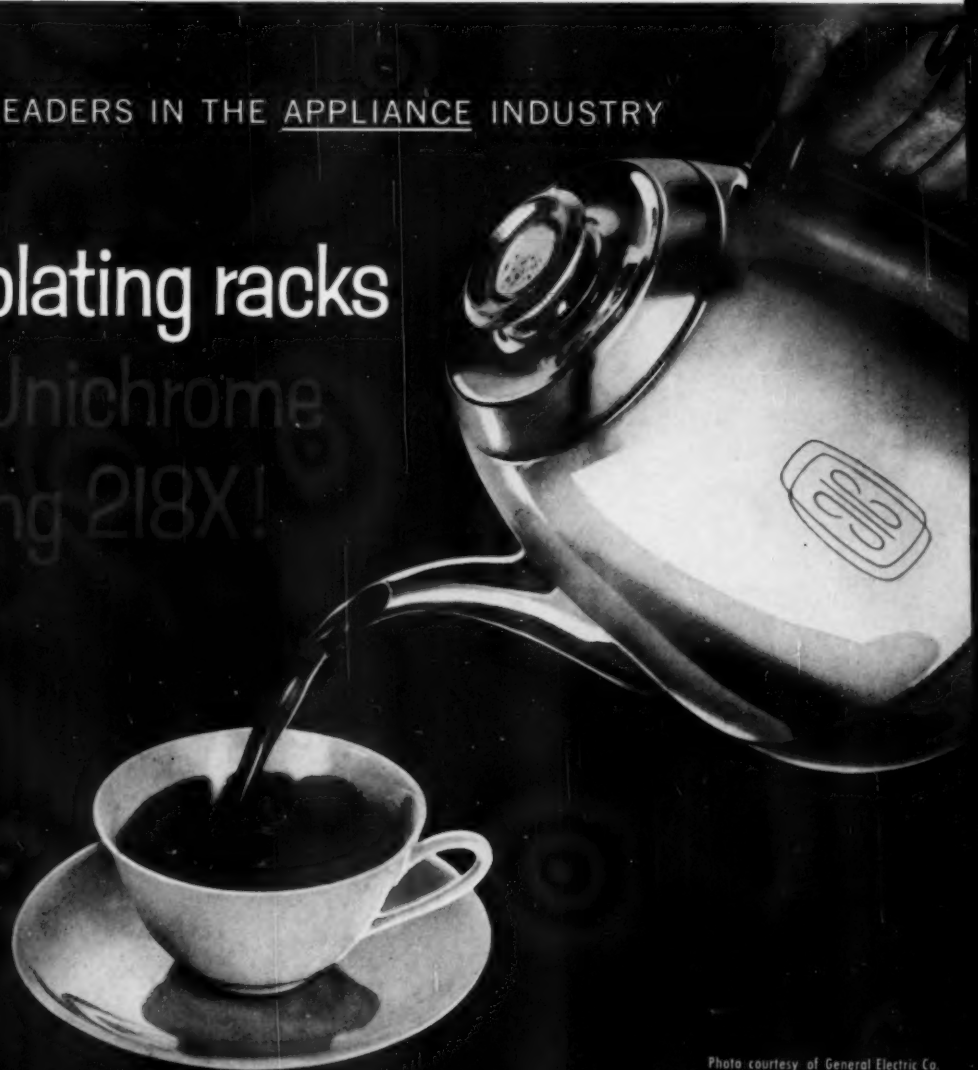

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